
State of California
The Resources Agency
Department of Water Resources

WHITEWATER AND RIVER BOATING REPORT

FINAL

R-16

**Oroville Facilities Relicensing
FERC Project No. 2100**



JANUARY 2004

**ARNOLD
SCHWARZENEGGER**
Governor
State of California

MIKE CHRISMAN
Secretary for Resources
The Resources Agency

LINDA S. ADAMS
Interim Director
Department of Water
Resources

**State of California
The Resources Agency
Department of Water Resources**

WHITEWATER AND RIVER BOATING REPORT

FINAL

R-16

**Oroville Facilities Relicensing
FERC Project No. 2100**

This report was prepared under the direction of

Douglas Rischbieter Resource Area Manager, Staff Environmental Scientist, DWR

by

Anne Lienemann Environmental Planner, EDAW, Inc.
Peter Jonas GIS Specialist, EDAW Inc.

Assisted by

Jim Vogel Sr. Environmental Planner, EDAW, Inc.

This page intentionally left blank.

REPORT SUMMARY

This study is needed to help meet the Federal Energy Regulatory Commission's (FERC) direction to include information on existing recreation uses at project facilities and water in the license application (Chapter 1, Subpart F, Section 4.51 of 18 Code of Federal Regulations [CFR]).

The objectives of this study are to describe whitewater and river boating activities on the Feather River within the study area, to examine effects of Project operations on boating activities, to evaluate solutions to any identified whitewater and river boating issues, and ultimately to provide useful information for planning recreational experiences for appropriate water-related activities.

In this report, the Feather River is analyzed in two reaches, the upper reach and the lower reach. This report describes a reach of the North Fork Feather River terminating within the Project boundary, and makes comparisons with similar runs throughout the area, State, and region (Section 5.1). Section 5.2 describes the lower reach, the lower reach user group, and issues identified for this reach. Section 5.3 briefly discusses resources and access constraints identified on the Middle Fork of the Feather River. A stakeholder-proposed whitewater park is discussed in Section 5.4. Section 6.0 addresses whitewater and river boating-related issues, and concerns, and possible actions that could be taken to address these concerns.

On the North Fork Feather River, the run is used mainly by local people and only when the reservoir lowers to an elevation where they feel enough whitewater is exposed to make the run worth boating. This run is comparable to other runs in the area, State, and Western United States. A lack of flow information and difficult accessibility are the primary issues affecting use of the upper reach. Possible actions proposed by stakeholders to address these concerns include providing flow information and running a water shuttle on weekends to provide easier and faster take-out access.

On the lower reach (Feather River from Oroville Dam to Gridley), river boating is popular with both motorized and non-motorized boaters. Reported river boating issues include access, flow rates, fishing regulations, and lack of facilities. Possible actions to address these concerns include improving launch access, increasing flow, increasing California Department of Fish and Game (DFG) patrols, adding more toilet and trash facilities, and providing better maps and information on the location of boat ramps, access roads, and other facilities along the Feather River.

One stakeholder proposal for future recreation in the Oroville area is the development of a "whitewater park." A whitewater focus group convened for this study generated preliminary ideas for potential whitewater park features, usage, and possible locations.

This page intentionally left blank.

TABLE OF CONTENTS

REPORT SUMMARY	RS-1
1.0 INTRODUCTION.....	1-1
1.1 Background Information	1-1
1.1.1 Study Area	1-1
1.2 Description of Facilities.....	1-2
1.3 Current Operational Constraints	1-6
1.3.1 Downstream Operation	1-7
1.3.1.1 Instream Flow Requirements.....	1-7
1.3.1.2 Temperature Requirements.....	1-7
1.3.1.3 Water Diversions	1-8
1.3.1.4 Water Quality	1-9
1.3.2 Flood Management.....	1-9
2.0 NEED FOR STUDY.....	2-1
3.0 STUDY OBJECTIVE(S)	3-1
4.0 METHODOLOGY	4-1
4.1 Historic Information.....	4-1
4.2 Field Reconnaissance	4-1
4.3 Focus Group.....	4-2
4.3.1 Description of Focus Group Participants.....	4-2
4.4 Lower Reach Survey	4-3
4.4.1 Description of Lower Reach Survey Respondents.....	4-6
5.0 RESULTS & DISCUSSION	5-1
5.1 Upper Reach	5-1
5.1.1 Description of the Big Bend Run	5-1
5.1.2 Characterization of the Big Bend User Group.....	5-6
5.1.3 Reservoir Elevation and Availability of Big Bend Run	5-7
5.1.4 Flows on the Big Bend Run	5-11
5.1.5 Issues with the Big Bend Run	5-12
5.1.5.1 Flow Information	5-13
5.1.5.2 Access	5-13
5.1.6 Comparisons to the North Fork Feather River Big Bend Run	5-13
5.1.6.1 Runs Comparable to the Big Bend Run.....	5-13
5.1.6.2 Comparison of Big Bend Run to Other Feather River Runs.....	5-14
5.1.6.3 Comparison of Big Bend Run to Other Rivers in the Area, State, and Region.....	5-17
5.2 Lower Reach	5-19
5.2.1 Description of Lower Reach Segments.....	5-19

5.2.1.1	Segment 1: Diversion Pool	5-20
5.2.1.2	Segment 2: Feather River from the Fish Barrier Dam to the Thermalito Afterbay Outlet	5-20
5.2.1.3	Segment 3: Feather River from the Thermalito Afterbay Outlet to Gridley	5-22
5.2.2	Characterization of Lower Reach User Group	5-25
5.2.3	Issues on the Lower Reach	5-29
5.2.3.1	Segment 1: Diversion Pool	5-30
5.2.3.2	Segment 2: Feather River from the Fish Barrier Dam to the Thermalito Afterbay Outlet	5-30
5.2.3.3	Segment 3: Feather River from the Thermalito Afterbay Outlet to Gridley	5-32
5.3	Middle Fork Feather River	5-34
5.4	Stakeholder-PROPOSED Whitewater Park.....	5-37
5.4.1	Possible Features of a Potential Whitewater Park in the Oroville Area.....	5-37
5.4.2	Usage of and Demand for a Whitewater Park.....	5-38
5.4.3	Locations for a Potential Whitewater Park in the Oroville Area...	5-40
6.0	CONCLUSIONS	6-1
6.1	Upper Reach	6-1
6.1.1	Flows on the Big Bend Run	6-1
6.1.2	Lake Elevation and Availability of the Big Bend Run.....	6-1
6.1.3	Access to the Big Bend Run	6-2
6.1.4	Other Upper Reach Conclusions	6-4
6.2	Lower Reach	6-4
6.2.1	Segment 1	6-5
6.2.2	Segment 2	6-5
6.2.3	Segment 3	6-7
6.2.4	Other Lower Reach Conclusions	6-8
6.3	Middle Fork Feather River (MFFR).....	6-8
6.4	Stakeholder-PROPOSED Whitewater Park.....	6-9
7.0	REFERENCES.....	7-1
7.1	Documents and Literature Cited	7-1
7.2	Personal Communications.....	7-2

APPENDICES

Appendix A – Focus Group Survey and Discussion Questions
Appendix B – Definition of the Six Whitewater Difficulty Classes
Appendix C – Lower Reach Survey
Appendix D – Lake Oroville Elevations Since 1968

LIST OF TABLES

Table 4.3-1.	Description of focus group participants.	4-3
Table 4.4-1.	Summary of lower reach survey respondents.	4-6
Table 5.1-1.	Characterization of the Big Bend user group.	5-7
Table 5.1-2.	Big Bend run length.....	5-8
Table 5.1-3.	Big Bend run availability at various reservoir elevations 1988-2002.	5-11
Table 5.1-4.	Participant estimated flows on the Big Bend run.	5-12
Table 5.1-5.	Runs comparable to the Big Bend run.	5-14
Table 5.1-6.	Location and run class of other Feather River runs.....	5-14
Table 5.1-7.	Usage of other runs on the Feather River.	5-17
Table 5.1-8.	Big Bend run vs. other Feather River runs.	5-17
Table 5.1-9.	Other locations where focus group members whitewater boat.....	5-18
Table 5.1-10.	Big Bend run vs. other rivers in the area, State, and region.	5-19
Table 5.2-1.	Respondents use of lower reach segments and usual craft.	5-26
Table 5.2-2.	Season of use by lower reach segment.	5-26
Table 5.2-3.	Usual put-in by lower reach segment.	5-27
Table 5.2-4.	Usual take-out by lower reach segment.	5-28
Table 5.2-5.	Lower reach respondents' group characteristics.	5-28
Table 5.2-6.	Other activities that respondents participate in on the lower reach while boating.	5-29
Table 5.2-7.	Number of respondents who have taken or led a guided trip on the lower reach.....	5-29
Table 5.2-8.	Segment 1 respondents' stated issues.	5-30
Table 5.2-9.	Segment 2 respondents' stated issues.	5-31
Table 5.2-10.	Segment 3 respondents' stated issues.	5-33
Table 5.4-1.	Focus group participants projected individual use of a potential whitewater park in the Oroville area.	5-39

LIST OF FIGURES

Figure 1.1-1.	Study area.....	1-3
Figure 4.4-1.	Lower reach segments.....	4-5
Figure 5.1-1.	Description of the Big Bend Run.	5-3
Figure 5.1-2.	Put-in at PG&E's Poe Powerhouse.	5-2
Figure 5.1-3.	Chair and metal fragments at put in.	5-2
Figure 5.1-4.	The Big Bend Dam.....	5-5
Figure 5.1-5.	Take-out at Dark Canyon Car-top BR.	5-6
Figure 5.1-6.	Big Bend Run at various Lake Oroville elevations.....	5-9
Figure 5.1-7.	Runs comparable to the Big Bend Run.	5-15
Figure 5.2-1.	Afterbay outlet boat ramp.....	5-22
Figure 5.2-2.	Afterbay outlet.....	5-23
Figure 5.2-3.	Average monthly flow on the Feather River below the Afterbay outlet.	5-24
Figure 5.2-4.	Pelicans on Segment 3.	5-25
Figure 5.3-1.	Access to the Bald Rock Canyon Run	5-35
Figure 5.4-1.	Example of rodeo boating.	5-38
Figure 5.4-2.	Potential locations for whitewater park along the Feather River.....	5-41
Figure 5.4-3.	Potential whitewater park locations between the Thermalito Forebay and Afterbay.....	5-42

ACRONYMS

4WD	four wheel drive
af	acre-feet
BR	boat ramp
CFR	Code of Federal Regulations
cfs	cubic feet per second
DBW	California Department of Boating and Waterways
DFG	California Department of Fish and Game
DPR	California Department of Parks and Recreation
DUA	Day Use Area
DWR	California Department of Water Resources
FERC	Federal Energy Regulatory Commission
FRSA	Feather River Service Area
ISO	Independent System Operator
maf	million acre-feet
MFFR	Middle Fork Feather River
msl	mean sea level
MW	megawatts
NFFR	North Fork Feather River
NOAA	National Oceanic and Atmospheric Administration
OWA	Oroville Wildlife Area
PG&E	Pacific Gas and Electric
SWP	State Water Project
USACE	U.S. Army Corps of Engineers
USGS	U. S. Geological Survey
WFG	Whitewater Focus Group

GLOSSARY

flatwater boating	Boating on water that is not considered higher than Class I whitewater; there are no rapids or riffles that a beginner cannot handle.
play run	A whitewater run that allows the boater to have fun and practice their skills in river hydraulics, such as doing flips, spins, or twists in “play holes” or surfing waves.
portage	An alternate land-based route around a rapid or other river obstacle.
put-in	Starting point where boaters put their boats in the water. In many cases, a put-in is also a take-out for upriver runs.
surf wave	A dynamic water feature in the river that allows a boater to “surf” their boat in place.
take-out	Finishing point where boaters can take their boats out of the water. In many cases, a take-out is also a put-in for downriver runs.
whitewater boating	Boating on moving water where the surface becomes turbulent or frothy either by passing over rocks, through a narrow river channel, or down a steeper gradient (Armstead 2003).

1.0 INTRODUCTION

This is one of a series of related studies being conducted to assess and evaluate recreation resources associated with the Oroville Facilities (Federal Energy Regulatory Commission [FERC] Project No. 2100). Within the study area (area within the FERC boundary and ¼ mile outside of the boundary), the Feather River provides associated on-river recreation activities, such as kayaking, canoeing, and boat fishing. These activities can be affected by Project operations, by altering reservoir levels and diverting and releasing water back into the River. This report identifies the effect of Project operations on whitewater and river boating recreational experiences.

1.1 BACKGROUND INFORMATION

Lake Oroville was created by damming the Feather River; as a result, the Feather River runs both north and south of Lake Oroville. For the purposes of this report, the Feather River was divided into two reaches, the upper reach (portion of the river north of Lake Oroville) and the lower reach (portion of the river south of Lake Oroville). The river provides a range of recreational opportunities including swimming, wildlife viewing, and bank fishing, as well as boating activities such as kayaking, canoeing, and boat fishing. Project operations, including drawdown of the reservoir and water diversions and releases, alter the reservoir level as well as the flow within the river, affecting whitewater and river boating experiences.

This report focuses on two stretches of the Feather River—part of the North Fork, and three segments of the river south (downstream) of Lake Oroville. A brief discussion of resources and access constraints on the Middle Fork Feather River (MFFR) is also included. In addition, this report presents information on the boating activities associated with different sections of the river and effects of Project operations on those activities. Finally, this report includes a comparison of the Feather River and associated river-based recreation to other Northern California rivers, and discusses possible future improvements and developments on the Feather River.

1.1.1 Study Area

The study area consists of the area within the FERC boundary and within ¼ mile outside of the boundary. The areas of focus for this study are two reaches of the Feather River located within the study area. The first reach, from the Pacific Gas and Electric (PG&E) Poe Powerhouse¹ on the North Fork of the Feather River (upstream

¹The whitewater opportunities upstream of Poe Powerhouse are discussed in Pacific Gas and Electric Company's (PG&E) Project 2107 license application and in the Poe Whitewater Study (EDAW 2001). In the Project 2107 application, this site is referred to as the "Bardee's Bar Run take-out"; whitewater enthusiasts also recognize that this site provides "put-in" access to additional travel downstream into the Project 2100 area. This access point (Poe Powerhouse) and 0.75 miles downstream, to Big Bend Dam, are PG&E property and outside the Project 2100 boundary.

from the Project 2100 Boundary) to the Dark Canyon Car-top Boat Ramp (BR), on the North Fork arm of Lake Oroville (Figure 1.1-1), is referred to in this report as the upper reach or the “Big Bend” run. The second reach of the Feather River included in this analysis, referred to in this report as the lower reach, consists of the river downstream of the Oroville Dam, to the study area boundary (Figure 1.1-1). The following sites are associated with each reach of the Feather River:

Sites Associated with the Upper Reach

- ∄ Dark Canyon Car-top BR;
- ∄ PG&E's Poe Powerhouse (outside the Project 2100 Boundary); and
- ∄ Lime Saddle Marina and Boat Ramp.

Sites Associated with the Lower Reach

- ∄ Thermalito Diversion Pool;
- ∄ Thermalito Diversion Dam;
- ∄ Feather River Fish Hatchery;
- ∄ Fish Barrier Dam;
- ∄ Bedrock Park (outside Project 2100 Boundary)
- ∄ Riverbend Park (outside Project 2100 Boundary)
- ∄ Oroville Wildlife Area (OWA) Headquarters;
- ∄ Thermalito Afterbay outlet & boat ramp;
- ∄ OWA Palm Avenue entrance;
- ∄ OWA Vance Avenue entrance;
- ∄ OWA Pacific Heights entrance; and
- ∄ OWA Highway 70 entrance.

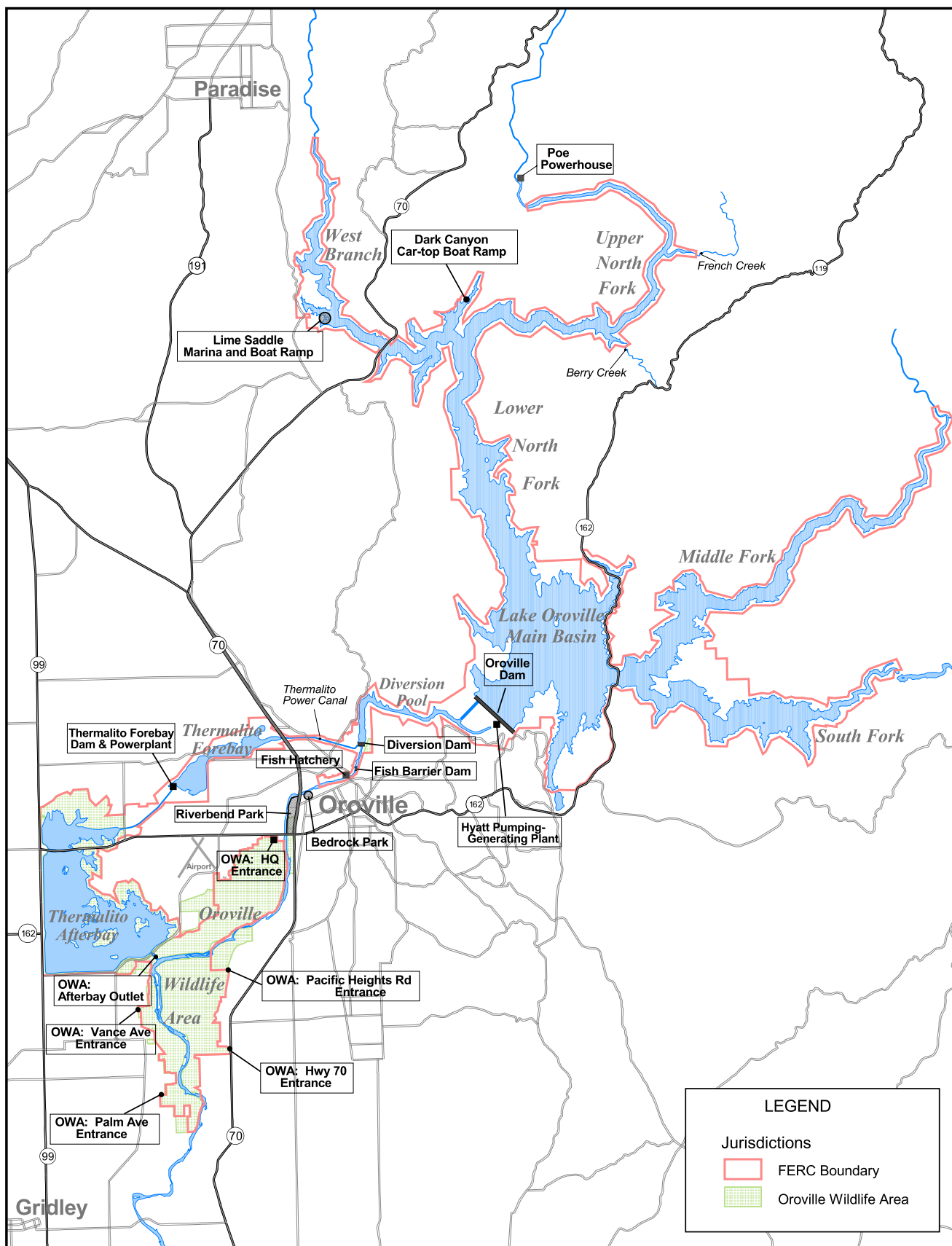
1.2 DESCRIPTION OF FACILITIES

The Oroville Facilities were developed as part of the State Water Project (SWP), a water storage and delivery system of reservoirs, aqueducts, power plants, and pumping plants. The main purpose of the SWP is to store and distribute water to supplement the needs of urban and agricultural water users in Northern California, the San Francisco Bay area, the San Joaquin Valley, and Southern California. The Oroville Facilities are also operated for flood control power generation, to improve water quality in the Delta, enhance fish and wildlife, and provide recreation.

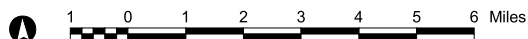
FERC Project No. 2100 encompasses 41,100 acres and includes Oroville Dam and Reservoir, three power plants (Hyatt Pumping-Generating Plant, Thermalito Diversion Dam Power Plant, and Thermalito Pumping-Generating Plant), Thermalito Diversion Dam, the Feather River Fish Hatchery and Fish Barrier Dam, Thermalito Power Canal, the OWA, Thermalito Forebay and Forebay Dam, Thermalito Afterbay and Afterbay Dam, transmission lines, and a relatively large number of recreational facilities. An overview of these facilities is provided in Figure 1.1-1. Oroville Dam, along with two

Figure 1.1-1. Study Area.

11 x 17 insert



Source: DWR GIS / EDAW 2003



Scale 1 : 142,560
1" = 2.25 miles

LEGEND

Jurisdictions

- FERC Boundary
- Oroville Wildlife Area

STATE OF CALIFORNIA
DEPARTMENT OF WATER RESOURCES

**Oroville Facilities Relicensing
FERC Project No. 2100**

Figure 1.1-1
(R-16)



Study Area

back of Figure 1.1-1

small saddle dams, impounds Lake Oroville, a 3.5-million-acre-foot (maf) capacity storage reservoir with a surface area of 15,810 acres at its maximum normal operating level of 900 feet above mean sea level (msl).

The hydroelectric facilities have a combined licensed generating capacity of approximately 762 megawatts (MW). The Hyatt Pumping-Generating Plant is the largest of the three power plants with a capacity of 645 MW. Water from the six-unit underground power plant (three conventional generating and three pumping-generating units) is discharged through two tunnels into the Feather River just downstream of Oroville Dam. The plant has a generating and pumping flow capacity of 16,950 and 5,610 cubic feet per second (cfs), respectively. Other generation facilities include the 3-MW Thermalito Diversion Dam Power Plant and the 114-MW Thermalito Pumping-Generating Plant.

Thermalito Diversion Dam, four miles downstream of the Oroville Dam, creates a tail water pool for the Hyatt Pumping-Generating Plant and is used to divert water into the Thermalito Power Canal. Thermalito Diversion Dam Power Plant is a 3-MW power plant located on the left abutment of the Diversion Dam. The power plant releases a maximum of 615 cfs of water into the river.

The Power Canal is a 10,000-foot-long channel designed to convey generating flows of 16,900 cfs to the Thermalito Forebay and pump-back flows to the Hyatt Pumping-Generating Plant. Thermalito Forebay is an off-stream regulating reservoir for the 114-MW Thermalito Pumping-Generating Plant. The Thermalito Pumping-Generating Plant is designed to operate in tandem with the Hyatt Pumping-Generating Plant and has generating and pump-back flow capacities of 17,400 cfs and 9,120 cfs, respectively. When in generating mode, the Thermalito Pumping-Generating Plant discharges into Thermalito Afterbay, which is contained by a 42,000-foot-long earth-fill dam. The Afterbay is used to release water into the Feather River downstream of the Oroville Facilities, helps regulate the power system, provides storage for pump-back operations, provides recreational opportunities, and provides local irrigational water. Several local irrigation districts also receive Lake Oroville water via the Afterbay.

The Feather River Fish Barrier Dam is downstream of the Thermalito Diversion Dam and immediately upstream of the Feather River Fish Hatchery. The flow over the dam maintains fish habitat in the low-flow channel of the Feather River between the dam and the Afterbay outlet, and provides attraction flow for the hatchery. The hatchery is an anadromous fish hatchery intended to compensate for salmon and steelhead spawning grounds made unreachable by construction of Oroville Dam. Hatchery facilities have a production capacity of 10 million fall-run salmon, 5 million spring-run salmon, and 450,000 steelhead annually (pers. comm., Kastner 2003). However, diseases have reduced hatchery production in recent years.

The Oroville Facilities support a wide variety of recreational opportunities. They include several types of boating and fishing, fully developed and primitive camping (including boat-in and floating sites), picnicking, swimming, horseback riding, hiking, off-road bicycle riding, wildlife watching, hunting, and visitor information sites with cultural and informational displays about the developed facilities and the natural environment. There are major recreation facilities at Loafer Creek, Bidwell Canyon, Spillway, Lime Saddle, and Thermalito Forebay. Lake Oroville has two full-service marinas, five car-top boat launch ramps, ten floating campsites, and seven two-stalled floating toilets. There are also recreation facilities at the Lake Oroville Visitors Center, Thermalito Afterbay, and the OWA.

The OWA comprises approximately 11,000 acres west of Oroville that is managed for wildlife habitat and recreational activities. It includes the Thermalito Afterbay and surrounding lands (approximately 6,000 acres) along with 5,000 acres adjoining the Feather River. The 5,000-acre area is adjacent to or straddles 12 miles of the Feather River, and includes willow and cottonwood-lined ponds, islands, and channels. Recreation areas include dispersed recreation (hunting, fishing, and bird watching), plus recreation at developed sites, including Monument Hill Day Use Area (DUA), model airplane grounds, and three boat launches on the Afterbay and two on the river, and two primitive camping areas. California Department of Fish and Game's habitat enhancement program includes a wood duck nest-box program and dry land farming for nesting cover and improved wildlife forage. Limited gravel extraction also occurs in a few locations.

1.3 CURRENT OPERATIONAL CONSTRAINTS

Operation of the Oroville Facilities varies seasonally, weekly and hourly, depending on hydrology and the objectives the California Department of Water Resources (DWR) is trying to meet. Typically, releases to the Feather River are managed to conserve water while meeting a variety of water delivery requirements, including flow, temperature, fisheries, diversion and water quality. Lake Oroville stores winter and spring runoff for release to the Feather River as necessary for Project purposes. Meeting the water supply objectives of the SWP has always been the primary consideration for determining Oroville Facilities operation (within the regulatory constraints specified for flood control, in-stream fisheries, and downstream uses). Power production is scheduled within the boundaries specified by the water operations criteria noted above. Annual operations planning is conducted for multi-year carryover storage. The current methodology is to retain half of the Lake Oroville storage above a specific level for subsequent years. Currently, that level has been established at 1,000,000 acre-feet (af); however, this does not limit drawdown of the reservoir below that level. If hydrology is drier or requirements greater than expected, additional water could be released from Lake Oroville. The operations plan is updated regularly to reflect forecast changes in hydrology and downstream operations. Typically, Lake Oroville is filled to its maximum operating level of 900 feet above msl in June and then lowered as necessary

to meet downstream requirements, to a minimum level in December or January (approximately 700 msl). During drier years, the reservoir may be drawn down more and may not fill to desired levels the following spring. Project operations are directly constrained by downstream operational demands and flood management criteria as described below.

1.3.1 Downstream Operation

An August 1983 agreement between DWR and DFG, entitled “Agreement Concerning the Operation of the Oroville Division of the State Water Project for Management of Fish & Wildlife,” sets criteria and objectives for flow and temperatures in the low-flow channel and the reach of the Feather River between Thermalito Afterbay and Verona. This agreement: (1) establishes minimum flows between Thermalito Afterbay outlet and Verona which vary by water year type; (2) requires flow changes under 2,500 cfs to be reduced by no more than 200 cfs during any 24-hour period (except for flood management, failures, etc.); (3) requires flow stability during the peak of the fall-run Chinook salmon spawning season; and (4) sets an objective of suitable temperature conditions during the fall months for salmon and during the later spring/summer for shad and striped bass.

1.3.1.1 Instream Flow Requirements

The Oroville Facilities are operated to meet minimum flows in the Lower Feather River as established by the 1983 agreement (see above). The agreement specifies that Oroville Facilities release a minimum of 600 cfs into the Feather River from the Thermalito Diversion Dam for fisheries purposes. This is the total volume of flows from the Diversion Dam outlet, Diversion Dam Powerplant, and the Feather River Fish Hatchery pipeline.

Generally, the instream flow requirements below Thermalito Afterbay are 1,700 cfs from October through March, and 1,000 cfs from April through September. However, if runoff for the previous April through July period is less than 1,942,000 af (i.e., the 1911-1960 mean unimpaired runoff near Oroville), the minimum flow can be reduced to 1,200 cfs from October to February, and 1,000 cfs for March. A maximum flow of 2,500 cfs is maintained from October 15 through November 30 to prevent spawning in overbank areas that might become de-watered.

1.3.1.2 Temperature Requirements

The Diversion Pool provides the water supply for the Feather River Fish Hatchery. The hatchery temperature objectives are 52°F for September, 51°F for October and November, 55°F for December through March, 51°F for April through May 15, 55°F for last half of May, 56°F for June 1-15, 60°F for June 16 through August 15, and 58°F for

August 16-31. In April through November, a temperature range of plus or minus 4°F is allowed for objectives.

There are several temperature objectives for the Feather River downstream of the Afterbay outlet. During the fall months, after September 15, the temperatures must be suitable for fall-run Chinook salmon. From May through August, the temperatures must be suitable for shad, striped bass, and other warmwater fish.

The National Oceanographic and Atmospheric Administration Fisheries (NOAA – Fisheries [formerly National Marine Fisheries Service]) has also established an explicit criterion for steelhead trout and spring-run Chinook salmon, memorialized in a biological opinion on the effects of the Central Valley Project and SWP on Central Valley spring-run Chinook and steelhead. As a reasonable and prudent measure, DWR attempts to control water temperature at Feather River mile 61.6 (Robinson's Riffle in the low-flow channel) from June 1 through September 30. This measure attempts to maintain water temperatures less than or equal to 65°F on a daily average. The requirement is not intended to preclude pump-back operations at the Oroville Facilities needed to assist the State of California with supplying energy during periods when the California Independent System Operator (ISO) anticipates a Stage 2 or higher alert.

The hatchery and river water temperature objectives sometimes conflict with temperatures desired by agricultural diverters. Under existing agreements, DWR provides water for the Feather River Service Area (FRSA) contractors. The contractors claim a need for relatively warm water during spring and summer for rice germination and growth (i.e., minimum 65°F from approximately April through mid-May, and minimum 59°F during the remainder of the growing season), though there is no explicit obligation for DWR to meet the rice water temperature goals. However, to the extent practical, DWR does use its operational flexibility to accommodate the FRSA contractors' temperature goals.

1.3.1.3 Water Diversions

Monthly irrigation diversions of up to 190,000 af (July 2002) are made from Thermalito Afterbay during the May through August irrigation season. Total annual entitlement of the Butte and Sutter County agricultural users is approximately 1.0 maf. After meeting these local demands, flows into the lower Feather River (and outside of the Project Boundary) continue to the Sacramento River and into the Sacramento-San Joaquin Delta. In the northwestern portion of the Delta, water is pumped into the North Bay Aqueduct. In the south Delta, water is diverted into Clifton Court Forebay, where the water is stored until it is pumped into the California Aqueduct.

1.3.1.4 Water Quality

Flows through the Delta are maintained to meet Bay-Delta water quality standards arising from DWR's water rights permits. These standards have been established to meet several water quality objectives such as salinity, Delta outflow, river flows, and export limits. The purpose of these objectives is to attain the highest reasonable water quality, considering all demands being made on the Bay-Delta waters. In particular, they protect a wide range of fish and wildlife including Chinook salmon, Delta smelt, striped bass, and the habitat of estuarine-dependent species.

1.3.2 Flood Management

The Oroville Facilities are an integral component of the flood management system for the Sacramento Valley. During the winter and spring, the Oroville Facilities are operated under flood control requirements specified by the U.S. Army Corps of Engineers (USACE). Under these requirements, Lake Oroville is operated to maintain up to 750,000 af of storage space to allow for the capture of significant inflows. Flood control releases are based on the release schedule in the flood control diagram or the emergency spillway release diagram prepared by the USACE, whichever requires the greater release. Decisions regarding such releases are made by DWR in consultation with the USACE.

The flood control requirements are an example of multiple use of reservoir space. When flood management space is not required to accomplish flood management objectives, the reservoir space can be used for storing water. From October through March, the maximum allowable storage limit (point at which specific flood release would have to be made) varies from about 2.8 to 3.2 maf to ensure adequate space in Lake Oroville to handle flood flows. The actual encroachment demarcation is based on a wetness index, computed from accumulated basin precipitation. This allows higher levels in the reservoir when the prevailing hydrology is dry. When the wetness index is high in the basin (i.e., high potential runoff from the watershed above Lake Oroville), required flood management space is at its greatest to provide the necessary flood protection. From April through June, the maximum allowable storage limit is increased as the flooding potential decreases, which allows capture of the higher spring flows for use later in the year. During September, the maximum allowable storage decreases again to prepare for the next flood season. During flood events, actual storage may encroach into the flood reservation zone to prevent or minimize downstream flooding along the Feather River.

This page intentionally left blank.

2.0 NEED FOR STUDY

DWR is currently in the process of renewing its license for the Oroville Facilities. FERC is responsible for granting the license and requires the applicant, DWR, to assess and plan for various resources including recreation. This study is needed to identify effects of Project operations on whitewater and river boating activities on the Feather River within the study area. This study will also help DWR meet FERC's direction regarding preparation of a comprehensive recreation plan, as well as developing information for the license application regarding existing recreation uses at project facilities and waters (Chapter 1, Subpart F, Section 4.51 of 18 Code of Federal Regulations [CFR]).

This page intentionally left blank.

3.0 STUDY OBJECTIVE(S)

The primary objectives of this study are to identify existing recreational boating opportunities associated with the Feather River in the study area, and to identify and assess ways to maintain and enhance river-related recreational experiences for appropriate water-related activities such as kayaking, canoeing, and boat fishing. Accordingly, this study describes the whitewater and river boating activities occurring on two reaches of the Feather River within the study area, examines the effects of Project operations on river-related recreation including boating, and discusses potential improvements that could enhance whitewater and river boating activities in the study area.

This page intentionally left blank.

4.0 METHODOLOGY

Information for this report was gathered from several sources, including historic data provided by DWR, field reconnaissance, a focus group discussion and survey, and user surveys. DWR provided historical Feather River flow and reservoir elevation information. The focus group was convened to provide information on the upper reach. Field reconnaissance was conducted along both the upper and lower reaches to characterize boating, access, and facilities along the river. Finally, users were surveyed about river boating on the lower reach.

4.1 HISTORIC INFORMATION

Lake Oroville elevation data from 1968 to 2002 and mapping data of several lake levels were provided by DWR (pers. comm., Creel 2003; DWR 2002). Elevation and mapping data were used to determine Big Bend run availability and length. Historical flow data for the upper reach were provided by U. S. Geological Survey (USGS) and were used to determine flows on the Big Bend run (USGS 2003). Lower reach flow information was provided by DWR's California Data Exchange Center (DWR 2003). Other whitewater studies were reviewed, including the Poe Whitewater Boating Assessment Report (EDAW, Inc. 2001). While this report provided background information, the analysis and conclusions of that controlled-flow study were not useful for this report, as the flow for this resource is not controlled by the managing agency.

4.2 FIELD RECONNAISSANCE

Field reconnaissance for the upper reach consisted of site visits to the informal put-in at Poe Powerhouse (owned and operated by PG&E) and take-out at Dark Canyon Car-top BR, and evaluation and photography of facilities, parking, signage, and access at each location. To determine characteristics of the Big Bend run, whitewater boaters boated the run and a professional, comprehensive videotape of the run was made available. A controlled flow study was not performed, as DWR does not control the flows out of PG&E's Poe Powerhouse and altering flows was not feasible. The study plan for this study initially prescribed a review of the Poe Whitewater Study (EDAW, Inc. 2001) which is a controlled-flow study; for the reasons mentioned previously, this study was not applicable.

Reconnaissance on the lower reach of the Feather River included a trip down the river in boats representative of those typically used on that stretch of the river. On May 7, 2003, two EDAW researchers floated down the river, one in a canoe with a local whitewater expert and one in drift boat with a boat fishing expert. On this trip, video and photographs were taken of the put-in and take-out, rapids, facilities along the river, good fishing spots, and wildlife on the river. During other various site visits, the parking, access roads, and signage were evaluated.

4.3 FOCUS GROUP

A focus group was conducted to characterize the upper reach and determine how the whitewater run on that reach compares with other runs. The group also provided information related to a stakeholder-proposed “whitewater park” development. The focus group was held May 7, 2003 in Chico, CA and consisted of 11 people, mostly members of a local whitewater group known as the *Chico Paddleheads*. This local whitewater enthusiast group was asked to select members who were river boaters with local and some regional knowledge to participate in the focus group. Eight of the 11 participants had boating experience on the Big Bend whitewater run on the North Fork Feather River (NFFR). The other three participants had whitewater experience, though not on the Big Bend run. Participants without experience on the Big Bend run contributed information on the lower reach and on the proposed whitewater park. All participants filled out a survey that asked questions about the upper reach, lower reach, proposed whitewater park, and other whitewater sites in the area. Survey design was based, in part, on a review of National Park Service standards and methods (Whittaker, Shelby, Jackson, & Beschta. 1993). Following the survey, participants were asked a series of group discussion questions on the survey topics. The survey and discussion questions can be found in Appendix A.

Six of the eleven focus group participants had boated the lower reach. These six participants answered questions on the lower reach in the discussion and filled out the lower reach portion of the focus group survey.

4.3.1 Description of Focus Group Participants

Most of the focus group participants rated their skill level as intermediate (Class III or IV) or advanced (Class IV-V [see Appendix B for a description of whitewater classes]). Two participants rated themselves as experts and one individual rated her skill level as beginner (Class I-II). Most of the participants were either whitewater or flatwater river boaters. The participants spend anywhere from 10 to 120 days a year whitewater boating with over half of the participants spending 30 to 80 days a year whitewater boating and an overall average of 51 days a year. The majority of focus group participants use hard shell kayaks as their usual craft, though one uses a cataraft and two listed open canoe with flotation in addition to hard shell kayak as their usual craft. The majority of participants were male and ranged in age from 22 to 59, with an average age of 40 years. Most participants were from the greater Chico area, including Oroville and Paradise. One individual was from Anderson/ Shasta County. Table 4.3-1 gives summary profiles of the focus group participants.

Table 4.3-1. Description of focus group participants.

Participant Number	Skill Level	Annual Days Spent Whitewater Boating	Usual Craft	Age	Sex	City of Residence
1	Advanced	70	Hard shell kayak	26	Male	Chico, CA
2	Advanced	40	Catacraft	50	Male	Anderson, CA
3	Expert	30-50	Hard shell kayak, open canoe with flotation, self-bailing raft	35	Male	Oroville, CA
4	Advanced	100	Hard shell kayak	49	Male	Chico, CA
5	Beginner	60	Hard shell kayak	59	Female	Chico, CA
6	Advanced	40-80	Hard shell kayak	38	Male	Chico, CA
7	Expert	120	Hard shell kayak	22	Male	Chico, CA
8	Advanced	40	Hard shell kayak, open canoe with flotation	42	Male	Paradise, CA
9	Intermediate	20+	Hard shell kayak	40	Male	Chico, CA
10	Intermediate	10	Hard shell kayak	38	Male	Chico, CA
11	Intermediate	15-20	Hard shell kayak	43	Male	Oroville, CA

Source: EDAW 2003.

4.4 LOWER REACH SURVEY

To obtain information on river boating on the lower reach, a mailback survey was developed and distributed (Appendix C). The survey divided the lower reach into three segments: Segment 1 (the Thermalito Diversion Pool), Segment 2 (Feather River, from the Fish Barrier Dam to the Thermalito Afterbay outlet [also called the low flow channel]), and Segment 3 (Feather River, from the Thermalito Afterbay outlet to Gridley). This segmentation was used to separate the very different characteristics and uses of the river in these three areas (Figure 4.4-1).

The lower reach mailback survey was sent to 64 people, including 58 recreation visitor on-site survey respondents, five fishing guides, and one paddling group member. The majority of the survey recipients had already completed on-site surveys for Oroville Facilities Relicensing Study R13 - Recreation Surveys (DWR 2003b). These individuals were chosen to receive a river boating survey because they had been contacted on the lower reach and listed their primary activity as either boat fishing, motorboating, kayaking, or canoeing, or listed their primary boating site as the Diversion Pool, OWA downstream of Highway 162, or Feather River above Highway 162.

Due to the high use of the lower reach for fishing, it was determined that fishing guides should also be included in the mailback survey candidate pool. An internet search was performed to find fishing guides, and those found were contacted by email and asked whether they boated on any of the three lower reach segments and if they would fill out

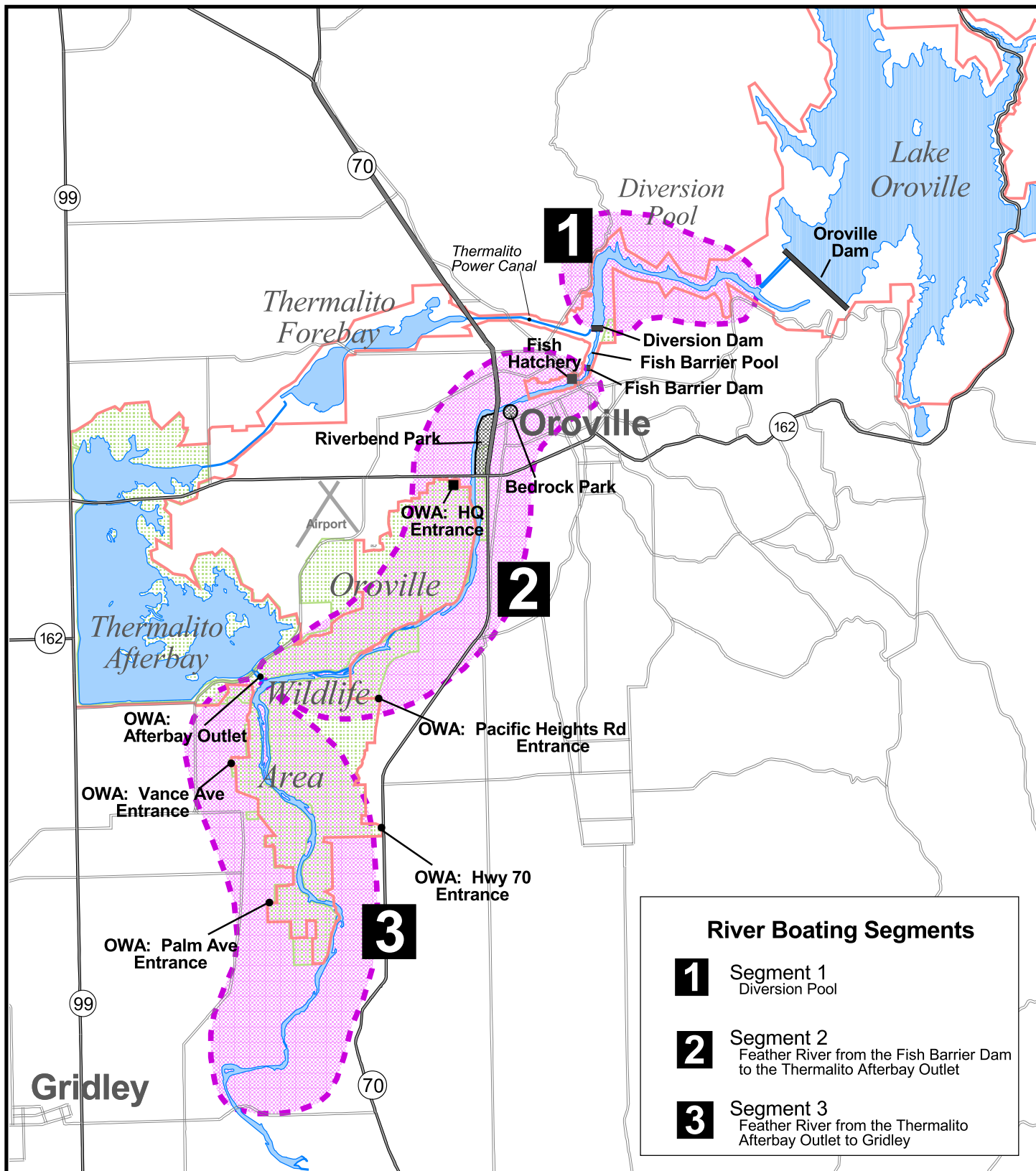
a survey. Out of the 12 guides contacted, five responded that they did boat on at least one of the three segments and would fill out a survey.

In addition to the Chico Paddleheads, members of the Shasta Paddlers and Gold Country Paddlers were asked to fill out the mailback survey in an attempt to include information from other user groups. One individual from Gold Country Paddlers agreed to fill out the survey.

Of the 64 surveys sent out, only 16 were completed and returned. One of these was not a river boater and therefore was removed from the analysis. Ten of the 64 surveys were returned as not deliverable. Although the survey provides valuable information, due to the small sample size and low return rate (25 percent), the survey is not statistically valid.

Figure 4.4-1. Lower Reach Segments.

8.5 x 11 insert



Source: DWR GIS / EDAW 2003



Scale 1 : 142,560
1" = 2.25 miles

Jurisdictions

FERC Boundary

Oroville Wildlife Area

STATE OF CALIFORNIA
DEPARTMENT OF WATER RESOURCES

**Oroville Facilities Relicensing
FERC Project No. 2100**

Figure 4.4-1
(R-16)



Lower Reach Segments

Prepared by: PJ -- EDAW, Inc. Date: 9/3/03 P:\2000\0s016.gis\arcview\rec_acc.apr

4.4.1 Description of Lower Reach Survey Respondents

Respondents to the mailback survey ranged in age from 27 to 60, but most were between 40 and 60; the average age was 46 years. Of the 15 respondents, only two were female. Most of the respondents river boat 30 days or less per year, though the number of days boated ranged from 6 to 125 days per year. The average number of days spent river boating was about 35 days per year. About half of the respondents (8 of 15) have only boated on any of the segments for less than 10 years. Four respondents have boated on any of the segments for 11 to 20 years, and two respondents have boated on the segments for over 20 years. Table 4.4-1 gives a summary description of the survey respondents.

Table 4.4-1. Summary of lower reach survey respondents.

Age	Sex	Annual Days Spent River Boating	Number of Years Respondent has been Boating on Any of the Segments
46	Male	35	4
48	Male	6	2
47	Male	30	25
48	Male	40	15
34	Male	50	10
57	Male	30	2
60	Male	125	11
57	Female	30-40	1
47	Female	30	4
33	Male	10-15	2
37	Male	6-15	13
51	Male	30	6
46	Male	10	20
53	Male	16	21
27	Male	75	3

Source: EDAW 2003.

4.4.1 Description of Lower Reach Survey Respondents

Respondents to the mailback survey ranged in age from 27 to 60, but most were between 40 and 60; the average age was 46 years. Of the 15 respondents, only two were female. Most of the respondents river boat 30 days or less per year, though the number of days boated ranged from 6 to 125 days per year. The average number of days spent river boating was about 35 days per year. About half of the respondents (8 of 15) have only boated on any of the segments for less than 10 years. Four respondents have boated on any of the segments for 11 to 20 years, and two respondents have boated on the segments for over 20 years. Table 4.4-1 gives a summary description of the survey respondents.

Table 4.4-1. Summary of lower reach survey respondents.

Age	Sex	Annual Days Spent River Boating	Number of Years Respondent has been Boating on Any of the Segments
46	Male	35	4
48	Male	6	2
47	Male	30	25
48	Male	40	15
34	Male	50	10
57	Male	30	2
60	Male	125	11
57	Female	30-40	1
47	Female	30	4
33	Male	10-15	2
37	Male	6-15	13
51	Male	30	6
46	Male	10	20
53	Male	16	21
27	Male	75	3

Source: EDAW 2003.

5.0 RESULTS & DISCUSSION

This section synthesizes results for the upper and lower reaches of the Feather River from historical information, field reconnaissance, focus group discussion and survey results, and lower reach survey. For the upper reach, a description of the Big Bend whitewater run is included, along with a characterization of the run's user group, how reservoir elevation affects availability of the run, flows on the Big Bend run, and the issues concerning the run. Runs comparable to the Big Bend run are discussed, along with comparisons of the Big Bend run to other Feather River runs and other rivers in the area (Northern California), State, and region (western United States). For the lower reach, a description of the three segments, a characterization of the lower reach user group, and issues identified for each segment are discussed. Also discussed is a stakeholder-proposed whitewater park, including possible features, usage, demand, and potential locations.

5.1 UPPER REACH

For the purposes of this study, the upper reach of the Feather River includes the NFFR downstream from PG&E's Poe Powerhouse and much of the North Fork arm of Lake Oroville. In regards to this reach, the focus of this study is on the Big Bend run, which begins at Poe Powerhouse and continues to the confluence of the NFFR and Lake Oroville (Figure 5.1-1). The focus is on the Big Bend run because it is the only known publicly accessible whitewater run within the study area. There are several other runs located on the NFFR, however, the Big Bend run is the only one within the study area. The focus group discussion and survey are the primary sources of information for the following sections. Big Bend whitewater classifications referred to are those described by the focus group participants.

5.1.1 Description of the Big Bend Run

The Big Bend run is a Class III+ to IV intermediate play run, according to focus group participants (see Glossary for definition; Appendix B for definition of whitewater classes). Most focus group members who have boated this run characterized the quality of the whitewater experience on this run as "fun" and "challenging" (WFG 2003). It is one focus group members' favorite intermediate run, described as "one size fits all, it can be done by beginners or experts" (WFG 2003). Another focus group member noted that the river is "aesthetically surprisingly nice" at Big Bend, due to the bedrock banks along the river and the absence of the typically muddy reservoir shoreline.

The put-in for Big Bend is located on the Poe Powerhouse Road, reached via Highway 70 and Big Bend Road (see Glossary for definition of put-in). The put-in is on PG&E property at the Poe Powerhouse (outside the Project 2100 Boundary), where water diverted from farther upstream at the Poe Dam is transported to the Powerhouse and

released back into the river (Figure 5.1-2). The put-in is also used as the take-out for the Bardee's Bar run.

Figure 5.1-2. Put-in at PG&E's Poe Powerhouse.



Source: EDAW 2003.

Parking at the put-in is limited, and the spur road down to the put-in is accessible by four wheel drive (4WD) vehicle only. Approximately eight cars can park at the put-in, though there is additional parking on Poe Powerhouse Road. Focus group members have not encountered any problems with the amount of parking capacity at the put-in and generally regard it as adequate. It was noted during field reconnaissance and by focus group members that there are several metal fragments in the river and on the shore around the put-in that could be dangerous to cars, boats and people walking on the shore (Figure 5.1-3) (WFG 2003).

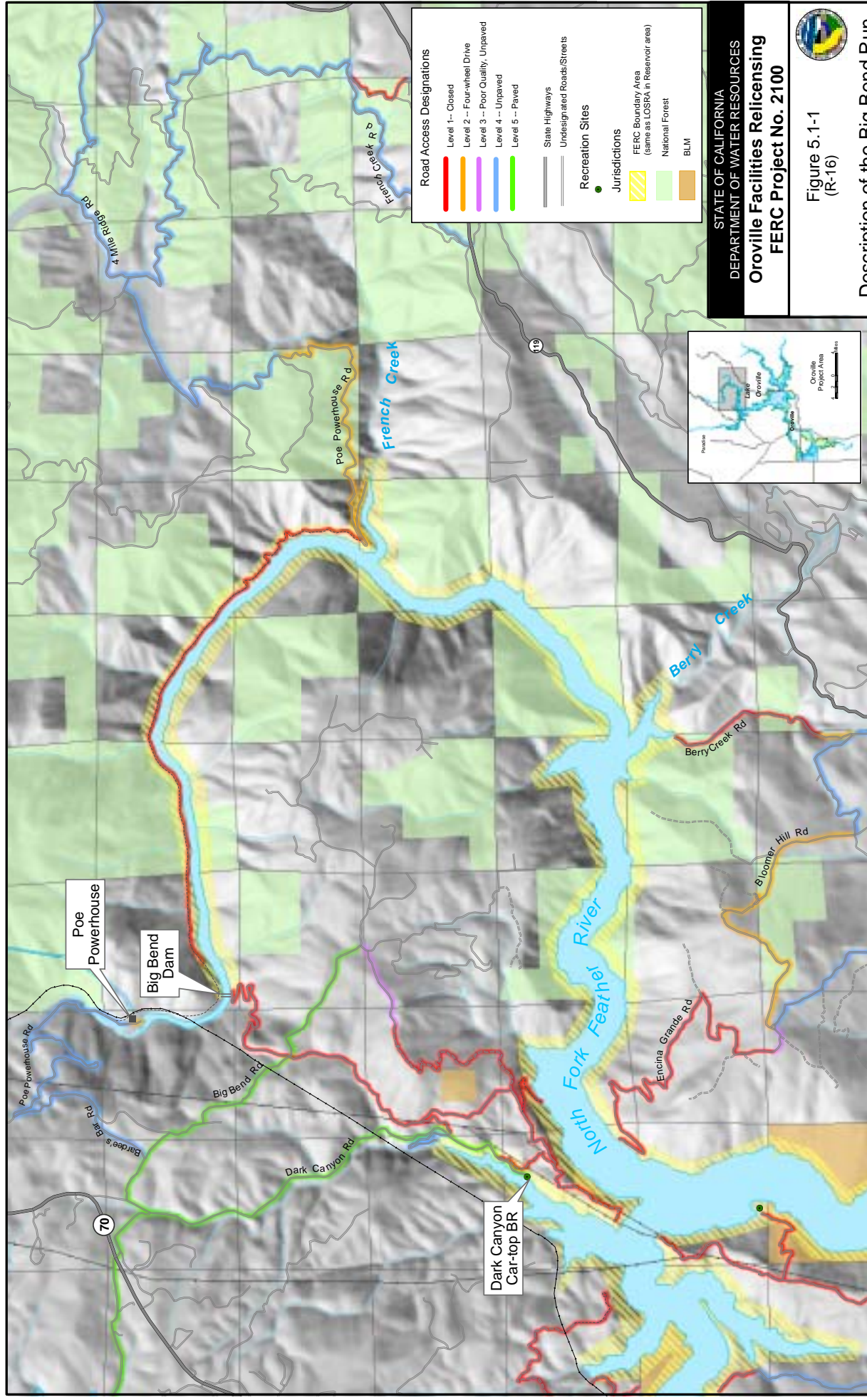
Figure 5.1-3. Chair and metal fragments at put in.



Source: EDAW 2003.

Figure 5.1-1. Description of the Big Bend Run.

11 x 17 insert



STATE OF CALIFORNIA
DEPARTMENT OF WATER RESOURCES
Oroville Facilities Relicensing
FERC Project No. 2100

Figure 5.1-1
(R-16)

Description of the Big Bend Run

back of Figure 5.1-1

Approximately 0.75 mile downstream from the put-in is the Big Bend Dam, an element of the Big Bend run that makes this run unique from other runs. One focus group member stated, “people talk about [the dam] long after they finish the run” (WFG 2003).

The Big Bend Dam was described by a focus group member as “a Class II move with Class V guts,” which provides “big fun” at the beginning of the run (WFG 2003). The dam has a notch in it, which causes water to flow over it in a V shape, described as looking like a “big tongue” by one focus group member (Figure 5.1-4). Whitewater boaters enjoy boating over this dam so much that they will repeatedly portage up around the dam to do it again (see Glossary for definition of portage). Focus group participants said the dam was very safe, but was “not a let down.” The group had never heard of anyone being injured while whitewater boating over the dam. In fact, some focus group participants had seen someone successfully swim down it head first during low flow. Other participants reported seeing a canoe with three boaters in it flip on the Big Bend Dam, but all three swam safely to shore. For safety purposes, there is a buoy line both before and after the dam and safety signs indicating dangerous waters. According to one report, an angler died at the dam sometime in the past few years (pers. comm., Sherman 2003).

Figure 5.1-4. The Big Bend Dam.



Source: EDAW 2003.

Downstream from the Big Bend Dam is a rapid called “Holy Moly,” which is a Class III+ rapid according to focus group participants. “Holy Moly” is followed by the “Box Car” rapid, also a Class III+ (as described by focus group participants). This rapid is named Box Car because there is a train box car in the river-left, (i.e., the left side of the river when facing downstream) which, according to a focus group member, has been there since before the railroad was rerouted. The box car creates a sieve in the river and can be dangerous, but it is easily avoided, and there is a straightforward portage around the box car if needed. Focus group respondents believe if the Box Car rapid is portaged, the difficulty of the run decreases and the Big Bend run becomes a Class III run. The

third and last rapid on the Big Bend run is called “Meat Grinder on Steroids” and is also a Class III+ rapid according to focus group participants.

The take-out for the Big Bend run is located at Dark Canyon Car-top Boat Ramp (BR) located off Dark Canyon Road (see Glossary for definition of take-out) (Figure 5.1-1). Dark Canyon Car-top BR is located several miles downstream of Meat Grinder on Steroids. There is parking for approximately 15 cars at the take-out, and focus group members have not encountered a shortage of parking at Dark Canyon (Figure 5.1-5).

Figure 5.1-5. Take-out at Dark Canyon Car-top BR.



Source: EDAW 2003.

5.1.2 Characterization of the Big Bend User Group

The Big Bend run was described as a “local run,” meaning it is used mainly by whitewater boaters who live in the area and know where the run is and when it is runnable. This description is reinforced by the fact that the run is not mentioned in two popular California whitewater guide books (Holbek and Stanley 1998; Cassady and Calhoun 1990). Therefore, the focus group, made up of local boaters, is a good representation of the user group for the Big Bend run. Eight of the 11 focus group members have boated on this run and filled out the survey section on the upper reach. The survey results for these participants are the basis for the characterization of the Big Bend user group. Survey results which characterize the user group are summarized in Table 5.1-1.

The Big Bend run has not been boated for a long period of time, probably because the run is usually inundated and has only recently been “discovered.” Over half of the participants have boated the run for five years or less, and only three of eight participants have been boating the run for 10 years or more. This is somewhat deceiving, since within the last 10 years Big Bend focus group members have only boated on Big Bend for a couple of years when the reservoir lowers to an elevation

where they feel there is enough whitewater exposed to boat the run (see Section 5.1.3 for an explanation of Big Bend run availability).

In a typical runnable year, the Big Bend run does not receive much use. The majority of focus group members only boat on the run 10 days or less. When boating on Big Bend, most focus group members spend 4 to 7 hours completing one run. All focus group members use a hard shell kayak to boat down Big Bend. Most participants boat the run with two to five other people, usually consisting of their friends or other paddlers. Therefore, groups down the Big Bend run are fairly small and made up of local boaters.

Table 5.1-1. Characterization of the Big Bend user group.

Participant Number	Number of Years since Began Boating on Big Bend	Annual Days Spent Boating on Big Bend	Usual Trip Length on Big Bend Run	Usual Craft Used on Big Bend	Typical Group Size on Big Bend Run	People In Typical Group on Big Bend Run
1	3	2-3	4 hours	Hard shell kayak	2-3	Friends only
2	1	NA	NA	Hard shell kayak	NA	Friends only
3	15	10	6-7 hours, 1 run	Hard shell kayak	2-3	Other paddlers
4	5	4	6 hours, 1 run	Hard shell kayak	4-5	NA
5	3	5-7	6-7 hours, 1 run	Hard shell kayak	NA	Family & friends
6	10	5	6 hours, 1 run	Hard shell kayak	4-5	Other paddlers
7	2	2	4-5 hours, 1 run	Hard shell kayak	6-10	Other paddlers
8	14	10-15	10 hours, 10 runs	Hard shell kayak	4-5	Other paddlers

Note: NA = Not Answered
Source: EDAW 2003.

5.1.3 Reservoir Elevation and Availability of Big Bend Run

The Big Bend run is located within the area of inundation of Lake Oroville; therefore, when Lake Oroville is at higher elevations, the Big Bend whitewater run is inundated. As the reservoir draws down, only the water flowing in the former river channel remains and the run is exposed. Whitewater boaters prefer the reservoir to be as low in elevation as possible to expose more of the run.

One question posed to the focus group was, “When is there enough of the run exposed that people will go there?” According to estimates by focus group members, the reservoir must be below 730 for the run to be useable. If the reservoir is any higher,

they feel there is not enough of the run exposed, and they will not boat on the Big Bend run. This determination is based on their “50/50 rule”—if there is more than about 50 percent flatwater paddling (i.e., more flatwater than whitewater), then they will tend not do the run. At a 730-foot reservoir water surface elevation, they believe the run terminates at French Creek (Figure 5.1-1). Focus group members estimated that this allows five miles of whitewater boating and five miles of flatwater paddling to the take-out at Dark Canyon. The other “rule” focus group members use for determining if a run is boatable is their “2-hour paddle out rule;” they will tend not do a run if the paddle out (paddle to the take-out) is longer than two hours. In their opinion, if water level in Lake Oroville is at 730 feet (or less), they estimate that the paddle-out is about two hours (or less) and, therefore, the Big Bend run is boatable.

According to DWR mapping data, the Big Bend run is actually about 14 miles long, four miles longer than focus group members estimated (Figure 5.1-6) (DWR 2002). At a lake elevation of 730 feet, the run actually terminates about 0.5 mile downstream of French Creek, which gives boaters slightly less than six miles of whitewater and slightly more than eight miles of flatwater. When there is seven miles of whitewater, the length which would offer 50 percent flatwater and 50 percent whitewater, the run terminates one mile upstream from Berry Creek and almost two miles downstream from French Creek. The run is seven miles of whitewater and seven miles of flatwater at a lake elevation of about 650 feet, an 80-foot difference from the elevation that the boaters believe is 50 percent whitewater and 50 percent flatwater (730 feet). Table 5.1-2 shows the length of whitewater and flatwater on the run and corresponding reservoir water surface elevation.

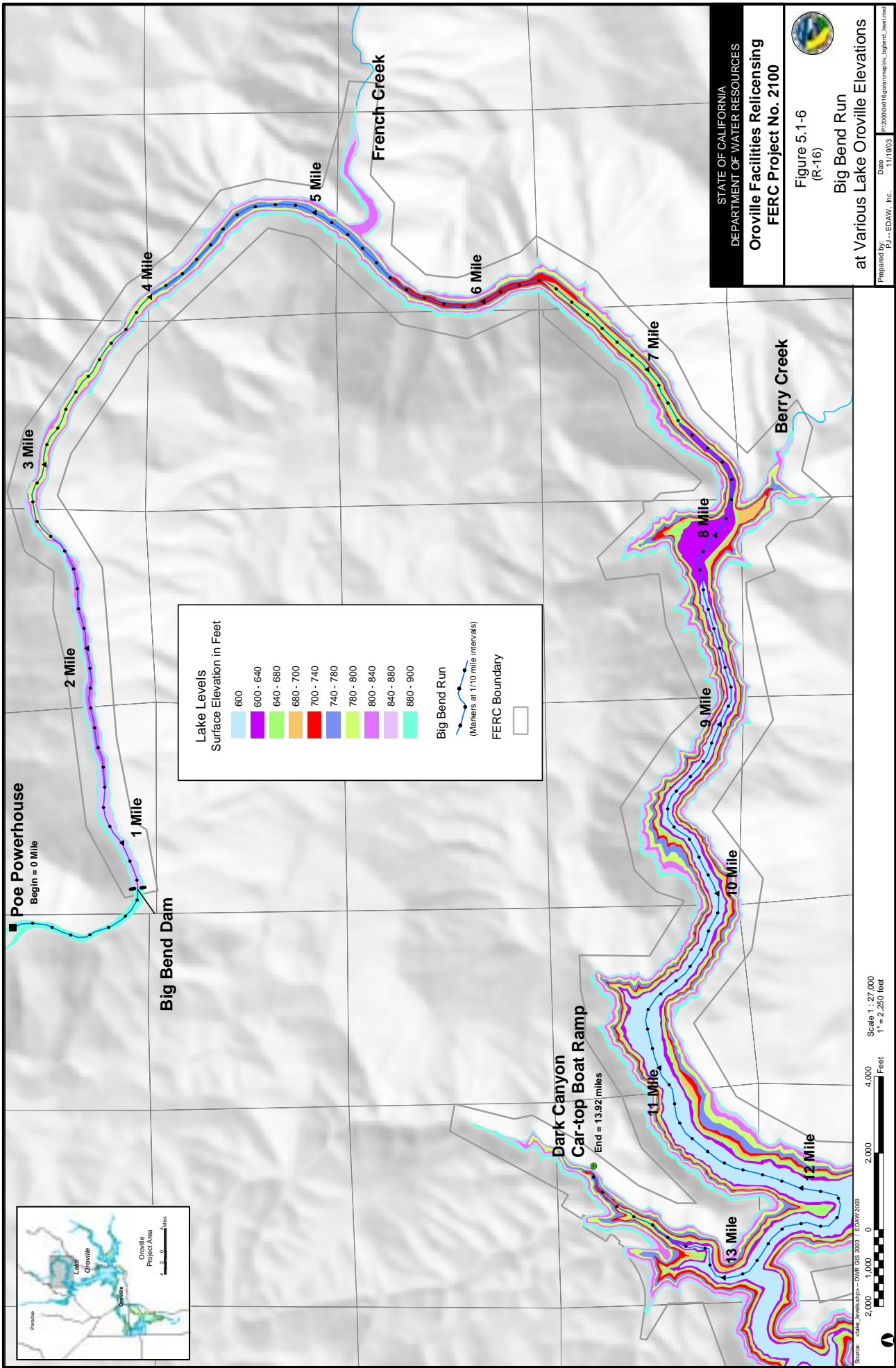
Table 5.1-2. Big Bend run length.

Miles of Whitewater (Percentage of Total Run Length)	Miles of Flatwater (Percentage of Total Run Length)	Corresponding Lake Oroville Elevation (Approximately)
4 miles (28.6%)	10 miles (71.4%)	800 feet
5 miles (35.7%)	9 miles (64.3%)	750 feet
6 miles (42.9%)	8 miles (57.1%)	720 feet
7 miles (50.0%)	7 miles (50.0%)	650 feet
8 miles (57.1%)	6 miles (42.9%)	620 feet

Source: EDAW 2003, DWR 2002.

Figure 5.1-6. Big Bend Run at Various Lake Oroville Elevations.

11 x 17 insert



STATE OF CALIFORNIA
DEPARTMENT OF WATER RESOURCES
Oroville Facilities Relicensing
FERC Project No. 2100


Figure 5.1-6
(R-16)
Big Bend Run
at Various Lake Oroville Elevations

Prepared by: PJ - EDW, Inc.
Date: 11/19/03
P:\2000\0916\jurimetry\bigbend_level.mxd

back of Figure 5.1-6

Focus group participants said they begin boating the Big Bend run on Labor Day weekend and continue through early November. According to the participants, Big Bend was runnable in 1990, 1991, 2001, and 2002. One focus group member said he thought the run was revealed in 1987 and that it was available for the following five years. However, according to historic reservoir elevations, the reservoir did not reach 730 feet or less in September, October, or November (the typical use season for this run according to focus group members) until 1988, and did not return to that level in those months until 1990 and continued for only three years. Tables D-1 through D-6 in Appendix D show at various lake elevations the years and number of days per month since 1968 (when Lake Oroville was created) that the reservoir has been at the given elevation.

Since 1988, when some members of the focus group started boating the run, the reservoir has reached 730 feet or less in seven of fourteen years. Table 5.1-3 shows the reservoir levels that correspond with different amounts of whitewater and flatwater from Table 5.1-2, and how often the reservoir has reached this level or lower since 1988.

Between 1988 and 2002, the reservoir water surface elevation has not been 650 feet or less, meaning boaters have not had 50 percent or more whitewater since the run has been boated. As Table 5.1-3 shows, the lower a given reservoir level, the fewer times that level has been reached. The table also shows the usual time period when the given elevation was reached. Generally, the given elevations were reached between August and December, which includes the defined typical use season of September to November.

Table 5.1-3. Big Bend run availability at various reservoir elevations 1988-2002.

Reservoir Elevation	Number of Years this Elevation was reached 1988-2002	Usual Months when this Level was Reached
800 feet	13 (Average days/year = 197)	August – January
750 feet	10 (Average days/year = 135)	August – December
730 feet	7 (Average days/year = 127)	August – December
720 feet	5 (Average days/year = 138)	August – December
650 feet	0	–
620 feet	0	–

Source: EDAW 2003; pers. comm., Creel 2003.

5.1.4 Flows on the Big Bend Run

The survey given to the focus group had three questions regarding flow, including the flow at which they normally boat the run, the minimum and maximum flow at which they will boat the run, and the flow that provides the highest quality whitewater experience.

Focus group participants had various responses to the question on the flow they normally boat the run (Table 5.1-4). Answers ranged from “whatever they let out” to 2,500 cfs. The minimum boatable flow was generally agreed upon to be between 400 and 700 cfs. Maximum boatable flow ranged from 2,000 to 10,000 cfs; however, most participants gave responses between 2,000 and 3,500 cfs. The flow that provides the highest quality whitewater experience had the smallest range, with answers ranging from 1,300 to 1,500 cfs, with most participants answering 1,500 cfs. No focus group members mentioned flow levels (either too high or too low) being a problem on the Big Bend run.

According to available USGS gage information, in September, October, and November of 1988, 1990, and 1991, when the focus group members said they have boated Big Bend, the average monthly flow has been between 775 cfs (November 1991) and 2,016 cfs (November 1988). This range is between what most focus group members provided as minimum and maximum flow numbers. The average for September to November in 1988, 1990, and 1991 was 1,469 cfs, close to the flow that focus group members identified as the flow that provides the highest quality experience (1,500 cfs). During the September to November time period, the data from 1988 onward show that average monthly flows generally do not drop below 1,100 cfs (USGS 2003). The data for each month are an average of the flows for each day of the month and do not reflect the changes in flow that can occur on a daily and hourly basis. However, since the water in this reach is not diverted for power generation, flows should usually be above the minimum flow levels generally identified by focus group members.

Table 5.1-4. Participant estimated flows on the Big Bend run.

Participant Number	Normal Flow (cfs)	Minimum flow (cfs)	Maximum flow (cfs)	Highest Quality Experience Flow (cfs)
1	2,200	1,200	4,500	Don't know
2	Don't know	Don't know	Don't know	Don't know
3	Whatever they let out	500	10,000	1,500
4	700-2,500	500	3,000	1,500
5	800	600	2,000-3,000	1,300
6	1,200	700	3,000	1,500
7	NA	NA	NA	NA
8	1,500	400	3,500	1,500

Note: NA = Not Answered.

Source: EDAW 2003.

5.1.5 Issues with the Big Bend Run

As a result of the focus group discussion, two distinct issues were mentioned regarding the Big Bend run. The first issue concerns flow information and the second concerns access and paddle-out time.

5.1.5.1 Flow Information

The focus group was questioned as to whether they had flow information for the NFFR available to them, and they responded that no predictive or real-time flow information is currently available. When asked how they know if the run is boatable, many responded that they know by word-of-mouth. However, flows out of the Poe Powerhouse can change on a daily and hourly basis. PG&E controls the flow out of the Poe Powerhouse (FERC License # 2107) and currently does not provide any public access to flow information.

5.1.5.2 Access

Currently, the only vehicular access point near the run is at Dark Canyon Car-top BR, which forces whitewater boaters to flatwater paddle for several miles. Focus group participants considered this an aspect they do not like about the run. They would like a take-out closer to French Creek, the point where, when they boat the run, the reservoir typically meets the river and the run expires. In response to the survey questions “What could be done to make whitewater boating on the North Fork of the Feather River a better experience for you? What would make you use this stretch of the Feather River more?” all five of the participants who answered this question mentioned shortening the paddle-out or providing better access to other potential take-out points.

5.1.6 Comparisons to the North Fork Feather River Big Bend Run

The focus group was asked, both in the discussion and in the survey, to compare the Big Bend run on the NFFR to other runs and rivers in the vicinity. The focus group listed runs that are similar to Big Bend and compared Big Bend to other Feather River runs, other rivers in Northern California and in the State of California, and other rivers in the western United States.

5.1.6.1 Runs Comparable to the Big Bend Run

During the focus group discussion, the eight participants who have boated the Big Bend run were asked, “What are other comparable runs to this one on the Feather River, in Northern California and within a 250 mile radius?”. Focus group members said that late in the year, when the Big Bend run is flowing at 2,500 cfs, it is comparable to the Chili Bar run on the South Fork of the American River, the Belden run on the NFFR, the Pigeon Point run on the Trinity River, and the Sims run on the upper Sacramento River. Table 5.1-5 lists these comparable runs and their classes, which can vary due to available flow levels or use of portages. A definition of whitewater classes is included in Appendix B. Figure 5.1-7 shows the locations of the runs comparable to Big Bend.

Table 5.1-5. Runs comparable to the Big Bend run.

Name of Run	Location	Run Class ¹
Big Bend	NFFR	III+ to IV
Belden	East Branch NFFR	IV to V
Chili Bar	South Fork American River	III to IV
Pigeon Point	Trinity River	II to IV
Sims	Upper Sacramento River	IV

¹Run classification depends upon flow.

Source: Holbek and Stanley 1998.

Although focus group members used 2,500 cfs as a basis for comparison, the available flow data indicates that Big Bend has not had an average flow as high as 2,500 cfs in the months the focus group members have boated on it. Although some days the flow may be 2,500 cfs or greater on Big Bend, no September, October, or November in 1988, 1990, or 1991 had an average flow of 2,500 cfs (USGS 2003).

5.1.6.2 Comparison of Big Bend Run to Other Feather River Runs

In the survey, focus group participants were asked if they boat on the three whitewater runs on the North Fork Feather River immediately upstream of the Big Bend run (outside of the study area), on other NFFR runs, or on the MFFR. Table 5.1-6 lists the location and classification of other Feather River runs.

Table 5.1-6. Location and run class of other Feather River runs.

Name of Run	Location	Run Class ¹
Poe	NFFR	IV+ - V
Rock Creek	NFFR	III - V
Cresta	NFFR	III - V
MFFR (Devils Canyon)	MFFR	V- - V

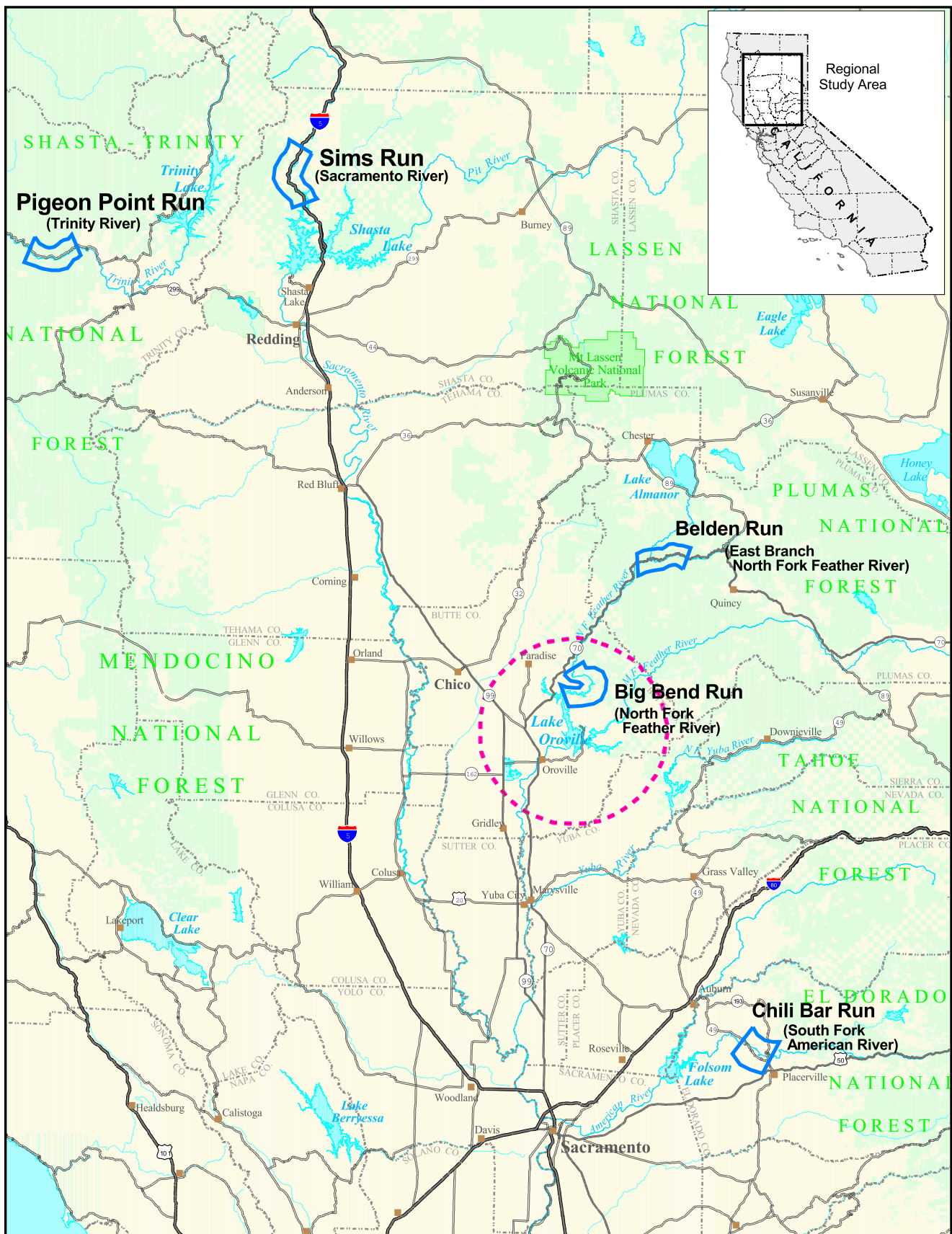
¹Run classification depends upon flow.

Source: Holbek and Stanley 1998.

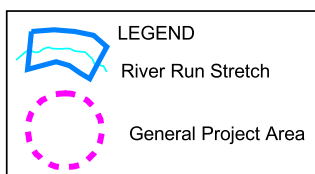
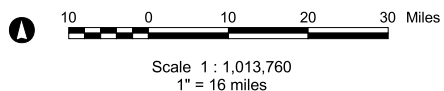
Most of the participants boat on the Rock Creek and Cresta runs of the NFFR, as well as on other NFFR runs, while approximately one quarter of participants boat the Poe run or the MFFR. The three most popular runs (Rock Creek, Cresta, and other NFFR runs) get most of their use in the spring and summer months, with lower use during fall and winter. Conversely, the Big Bend run has most of its usage in the fall months (September, October, November) according to focus group members. Rock Creek, MFFR, and other NFFR runs have similar ranges of average days boated per year (2 to 20 days), though the range for Cresta is 10 days shorter (2 to 10 days). The range of days boated per runnable year for Big Bend is between those for Cresta and the other runs (2 to 15 days). Usage of other runs on the Feather River is summarized in Table 5.1-7.

Figure 5.1-7. Runs Comparable to the Big Bend Run.

11 x 17 insert



Source: CA Spatial Data Library / EDAW, Inc. 2003



STATE OF CALIFORNIA
DEPARTMENT OF WATER RESOURCES

**Oroville Facilities Relicensing
FERC Project No. 2100**

Figure 5.1-7
(R-16)
**Runs Comparable
to the
Big Bend Run**



back of Figure 5.1-7

Table 5.1-7. Usage of other runs on the Feather River.

Comparable Run	Total Participants that Boat Run	Participants				Range of Days ¹
		Spring	Summer	Fall	Winter	
Poe	3	3	0	0	1	N/A ²
Rock Creek	8	6	7	4	2	2-20
Cresta	10	6	8	5	1	2-10
Other NFFR Runs	7	7	2	0	2	2-20
MFFR	4	3	1	0	0	3-20

¹ The range of the average number of days each boater spent on the run.

² No information was given.

Note: The number of participants using other Feather River runs is 10 (N=10). Participants listed more than one season.

Source: EDAW 2003.

To elaborate on these similarities, focus group members were also asked to compare the other Feather River runs to the Big Bend run. Out of the eight focus group members who have boated on Big Bend, the participants who also boat on the Poe run thought that the Poe run was about the same as the Big Bend run. Compared to the Rock Creek run, participants thought the Big Bend run was very similar to or worse than the Rock Creek run. Most of the people that also boat on the Cresta run thought Cresta was about the same as Big Bend. In comparison with other NFFR runs, participants thought Big Bend was the same or better than other NFFR runs. As for the Middle Fork, participants thought Big Bend was about the same or worse than the MFFR. Table 5.1-8 shows the number of people who marked each comparison response choice for each additional Feather River run.

Table 5.1-8. Big Bend run vs. other Feather River runs.

The Big Bend run is:	Compared to				
	Poe	Rock Creek	Cresta	Other NFFR Runs	MFFR
Much Worse	-	-	-	-	-
Worse	-	3	2	-	2
About the same	3	2	4	2	1
Better	-	-	1	2	-
Much Better	-	-	-	-	-

Note: For each comparison run, only the participants who boat on that run in addition to boating on the Big Bend run answered the question (N=8). Numbers in each row represent how many participants marked this comparison response choice.

Source: EDAW 2003.

5.1.6.3 Comparison of Big Bend Run to Other Rivers in the Area, State, and Region

The whitewater focus group members were also asked to list other places where they boat on a regular basis in Northern California. Five of ten participants listed the

American and Trinity rivers, and three listed Butte Creek and the Upper Sacramento River. Table 5.1-9 shows all participant responses, as well as the average number of days per year participants boat there and the season of use; as shown in the table, the fall season has the least amount of use at any of these other locations. Therefore, the Big Bend run provides an option in the fall when other runs are not being used or are not available.

Focus group members were also asked to compare the Big Bend run to other rivers in Northern California, the State of California, and the Western United States. Table 5.1-10 shows how the eight focus group members who have boated the Big Bend run rated it against other rivers in the area, State, and region. Most participants felt that the Big Bend run is better than average compared to other rivers in Northern California. Compared to other rivers in California, participants felt that the Big Bend run is average or better than average. The locations listed in Table 5.1-9 give a point of reference as to what the focus group members were using as comparison rivers in Northern California and the State of California. Only half of the participants who have boated Big Bend marked a choice for the Big Bend run compared to other rivers in the western United States. Of the four participants who answered this question, most felt that compared to other rivers in the Western United States, the Big Bend run is better than average.

Table 5.1-9. Other locations where focus group members whitewater boat.

Location	Number of Participants that Visit This Location	Average Number of Days/Year Participants Boat at This Location	Number of Participants by Season ¹			
			Summer	Spring	Fall	Winter
American River (including North and South Forks)	5	16	5	4	2	1
Trinity River	5	5	4	3	1	2
Butte Creek	3	7	-	3	1	3
Upper Sacramento River	3	5	1	3	-	2
Salmon River	2	11	-	2	-	-
Yuba River (North & South)	2	8	1	2	-	-
Cache Creek	1	1	1	1	-	1
Coloma River	1	NA	1	1	1	-
Grass Valley Creek	1	NA	-	1	-	-
Klamath River	1	1	1	1	-	1
Tuolumne River	1	5	1	-	-	-
West Branch Feather River	1	10	-	1	-	1

Note: NA = Not Answered. N=10.

¹ Participants listed more than one season.

Source: EDAW 2003.

Table 5.1-10. Big Bend run vs. other rivers in the area, State, and region.

The Big Bend Run is:	Compared to:		
	Other Northern California Rivers	Other California Rivers	Other Western US Rivers
Worse than average	-	-	-
Average	1	2	1
Better than average	6	3	3
Excellent	-	-	-
Among the very best	-	-	-
Not answered	1	3	4

Note: Participants that have boated the Big Bend run answered this question. N=8

Source: EDAW 2003.

5.2 LOWER REACH

The lower reach refers to the Feather River from Oroville Dam to the southernmost extent of the study area at the southern boundary of the OWA. Results for the lower reach include a description of the three lower reach segments, a characterization of the lower reach user group, and a discussion of issues identified by survey respondents and focus group members for each segment. In terms of the lower reach, focus group members include only those whitewater focus group members who filled out the lower reach section of the focus group survey.

5.2.1 Description of Lower Reach Segments

Due to differences in characteristics and recreational use, and to facilitate discussion, the Feather River below Oroville Dam was analyzed in three segments:

- € from Oroville Dam to the Thermalito Diversion Dam (the Diversion Pool);
- € from the Fish Barrier Dam to the Thermalito Afterbay outlet; and
- € from the Thermalito Afterbay outlet to Gridley (Figure 4.4-1).

A half-mile long segment of the river between the Thermalito Diversion Dam and the Fish Barrier Dam, referred to as the Fish Barrier Pool, receives very little boat or shoreline use and so is not included within the lower reach as discussed here. Segments are described in detail below.

5.2.1.1 Segment 1: Diversion Pool

The Diversion Pool is an impoundment created by the Thermalito Diversion Dam, with 4 miles of length, about 320 acres of surface area, and 10 miles of shoreline. The elevation of the pool is essentially constant throughout the year; therefore, the amount of surface acres and shoreline available for recreation varies little. At most times, the pool acts as an afterbay for the Hyatt Pumping-Generating Plant (located within Oroville Dam) as water enters the pool from Lake Oroville after passing through the turbines. The pool acts as a forebay, or holding pool, when the plant is pumping water back into Lake Oroville.

Vehicular access to this segment is from Cherokee Road, on the west side of the Diversion Pool. The entrance directs vehicles onto Burma Road, a gravel road that runs north about $\frac{3}{4}$ mile along the edge of the Diversion Pool to a gated point just past where the pool turns to the east. The area is designated as the Thermalito Diversion Pool Day Use Area within the Lake Oroville State Recreation Area. All parking is along Burma Road and at dispersed small pull-outs.

Day use activities at the Diversion Pool include biking, hiking, picnicking, and boating. The Brad Freeman Trail, popular with mountain bikers and other trail users, runs along both sides of the Diversion Pool and follows Burma Road on the west side. Bikers and hikers can also access the trail and the pool from the top of the north end of Oroville Dam, and from Oro-Dam Boulevard and the Lakeland Boulevard Trailhead Access on the east and south sides, respectively.

Only non-motorized boating such as canoeing or kayaking is allowed at the Diversion Pool. The Diversion Pool was opened to non-motorized boating in 1999; prior to that, no boating was allowed. Hand launching of boats occurs near the entrance where the road elevation is a few feet above the typical elevation of the pool. There are no traditional launch ramps. The only facility improvement at this site is a vault restroom and a garbage receptacle.

5.2.1.2 Segment 2: Feather River from the Fish Barrier Dam to the Thermalito Afterbay Outlet

Segment 2 begins at the Fish Barrier Dam and extends downstream to the Thermalito Afterbay outlet, a distance of slightly more than eight river miles. Because most of the river flow is diverted through the Thermalito Forebay and Afterbay, this segment is also known as the low flow channel. For the purposes of this study, this segment begins at the Fish Barrier Dam rather than the Thermalito Diversion Dam because people generally do not boat in the short segment of river between the two dams, though the area is open to non-motorized boating.

Most of the water flowing out of the Diversion Pool (Segment 1) is diverted at the Thermalito Diversion Dam into the Thermalito Power Canal, and carried to the

Thermalito Forebay. Water diverted into the Thermalito Power Canal and subsequently into the Thermalito Forebay and Afterbay is released back into the Feather River at the Thermalito Afterbay outlet. Water not diverted to the Forebay/Afterbay passes through the Thermalito Diversion Dam Powerplant and back into the Feather River (specifically, into the Fish Barrier Pool). The Fish Barrier Pool extends approximately three-fourths mile to where the flow passes over the top of the Fish Barrier Dam and into the low flow channel. A 1983 agreement between California Department of Fish and Game and DWR specifies that a minimum of 600 cfs is released into the river from the Thermalito Diversion Dam for fisheries purposes (see Section 1.3.1 for more detail on the agreement). A maximum of 615 cfs can be passed through the power plant. Although tremendous flows can be spilled over the Diversion Dam during flood periods, flow in this reach typically remains between 600-700 cfs.

Recreational activities in Segment 2 include fishing by boat and from the bank, wildlife viewing, boating, picnicking, hunting, photography, swimming, and sunbathing. Most boating between the Fish Barrier Dam and just below the Highway 162 bridge is non-motorized, because gravel bars, shallows, and a build-up of the underwater plant *Hydrilla* make it difficult to use a motorized boat other than a jet boat in some areas (pers. comm., Huber 2003). Motorized boats are more common on the remaining downstream portion of the segment.

The only public launch ramp in Segment 2 is a gravel ramp located upstream of the Afterbay outlet at the south end of the segment, though there is a private ramp at the River Reflections Campground on the east bank (approximately 1.5 miles below the Highway 162 bridge). In addition, there are informal launches just below the Highway 162 bridge, at the Fish Hatchery, below the Highway 70 bridge, and at Bedrock Park. Although Riverbend Park is a public park, the park's cement boat ramp is not currently available to the public. Commercial fishing guides pay an annual fee to the Feather River Recreation and Park District to use the ramp (pers. comm., Huber 2003). However, redevelopment of the park, scheduled for next year, will provide for public boat launching from the existing ramp. The only homes along the lower reach are located across the river from Riverbend Park; some of those residences have floating docks that are used as launching facilities. In addition to launch facilities, there are also toilets at the Feather River Fish Hatchery, Bedrock Park, and Riverbend Park. There are no toilet facilities between Riverbend Park and the Afterbay outlet.

In terms of use, the Feather River is extremely popular for salmon and steelhead fishing, and modestly so for shad and striped bass fishing. Bank fishing and wading are popular along this entire segment. Riverbend Park provides good bank fishing opportunities along approximately one mile of river above the Highway 162 bridge. Just below the bridge, the recently-improved Riverbend Park Fishing Ponds include parking, restrooms, and access for wading anglers to deep holes that contain salmon and steelhead. Slightly downstream and across from the Riverbend Ponds in the OWA is an informal launch area and unpaved parking area used primarily by wading anglers.

Wading anglers congregate in the riffles just south of the launch, which are considered good for salmon fishing. This launch is accessible off Highway 162 via the road that leads to the OWA headquarters. Farther downstream, access to the river is provided by gravel roads in the OWA that follow much of the west bank of the river.

The OWA includes the west side of the river from the Highway 162 bridge south and runs along both sides of the river beginning approximately four miles downstream from the bridge. Due to the low amount of motorized boat use and lack of development along the shoreline, the river is relatively quiet and peaceful. Moreover, this segment of the river provides excellent opportunities for viewing and photographing diverse wildlife including foxes, herons, egrets, turkeys, ducks, and turtles. However, there is some noise and visual disturbance to the setting of the river due to a cement plant and gravel operations along the east side of Segment 2 where the OWA runs only on the west side of the river.

On the lower portion of Segment 2, the river channel divides in an area sometimes called “the Islands” or the “S’es” (pers. comm., Huber 2003). This is a whitewater area that contains small rapids and was rated Class II by focus group members. This area is also considered a good steelhead and fly fishing area (pers. comm., Huber 2003), as is the Afterbay outlet, located at the downstream end of the segment. The unpaved launch ramp just before the outlet is a steep ramp that can get very muddy when it rains and is usually only useable by 4WD vehicles (Figure 5.2-1). Other vehicles do launch there, but often have difficulty exiting the launch ramp (pers. comm., Huber 2003).

Figure 5.2-1. Afterbay outlet boat ramp.



Source: EDAW 2003.

5.2.1.3 Segment 3: Feather River from the Thermalito Afterbay Outlet to Gridley

Segment 3 begins at the Thermalito Afterbay outlet, where some water that has been diverted through the Thermalito Forebay and Afterbay is released back into the Feather River (Figure 5.2-2). Instream flow requirements below the Thermalito Afterbay are

generally 1,700 cfs from October through March and 1,000 cfs from April through September (based on the 1983 agreement between DWR and DFG). However, flow requirements can change depending on previous April through July runoff. Throughout much of each year, summer flows are much higher than these minimums. For example, through most of June, July, and August 2002, flows in this segment were between 4,000 and 6,500 cfs (monthly averages were between 3,600 and 5,800 cfs). Figure 5.2-3 shows the average monthly flow in the Feather River below the Afterbay outlet for the last three years. The flow can be highly variable and can range from 1,700 cfs to 16,000 cfs within a given month.

Figure 5.2-2. Afterbay outlet.

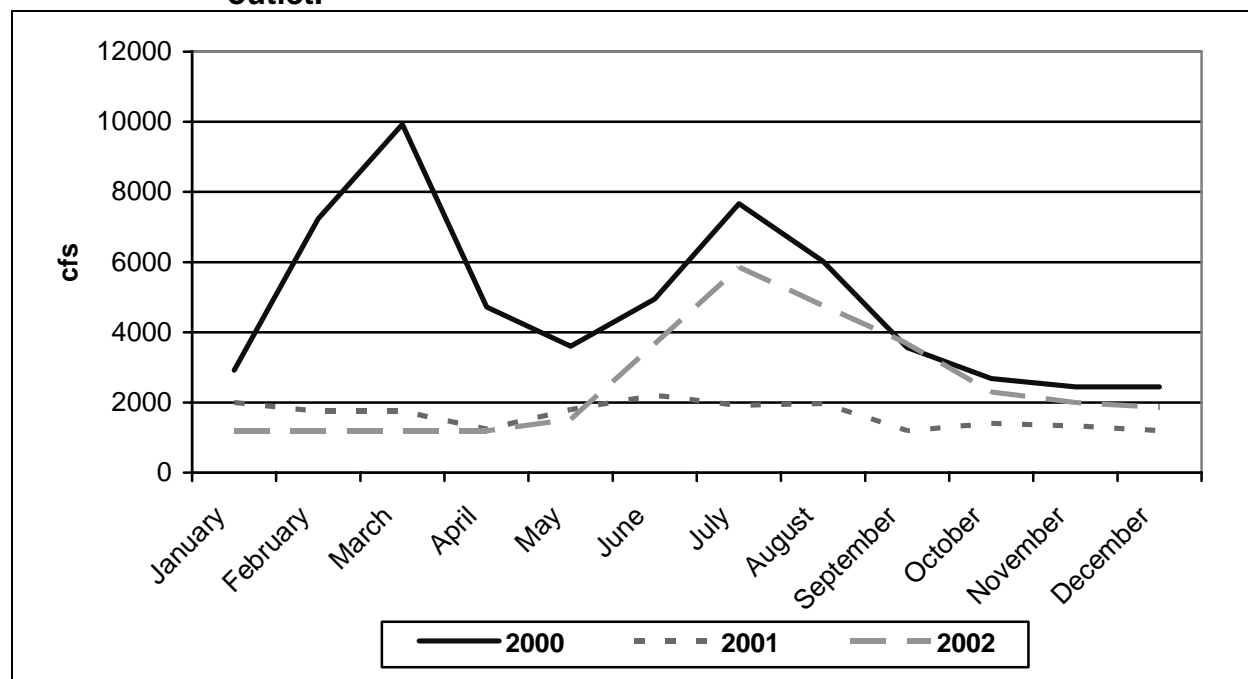


Source: EDAW 2003.

Segment 3 is eight miles long and although the segment ends at Gridley, the Project 2100 boundary ends about 3.25 miles upstream from Gridley at the OWA boundary. The OWA encompasses both sides of the river in this segment until just below Palm Avenue (Figure 4.4-1).

The Afterbay outlet is probably the most heavily used fishing spot on the lower reach, especially during July, August, and September. August is the peak time when anglers crowd on the concrete flanks of the Afterbay outlet structure, the nearby shore, and in boats to fish for salmon. At peak times, there can be up to 25 boats on the water and 150 people on shore (pers. comm., Huber 2003), which can cause chaos and disruptive behavior due to congestion. Anglers are attracted to this well-known location by the high concentration of fish in the 30-foot deep hole caused by the high outlet flows. This causes the fish to instinctively linger and attempt to follow the outlet flow upstream rather than continuing up the low flow channel (pers. comm., Huber 2003). The only visitor facilities near the outlet are vault toilets and trash cans at OWA camping areas C and F, which are located on either side of the outlet.

Figure 5.2-3. Average monthly flow on the Feather River below the Afterbay outlet.



Source: EDAW 2003, DWR 2003a.

A few informal gravel launch ramps are located downstream of the Afterbay outlet near the Vance and Palm Avenue entrances to the OWA. Shore fishing is popular in this area, especially from the Vance Avenue entrance south, where a gravel levee road runs parallel to the river. A similar levee road runs parallel on the opposite bank of the river and is accessible from the Pacific Heights Road and Highway 70 entrances to the OWA. Parking is located along the roadways and near the gravel launches. These roads allow easy access for walk-in shoreline and wade fishing. Boat fishing and motorized boats are also popular in this area. In general, Segment 3 has higher flow and deeper channels than Segment 2, making it more popular for jet boats and other motorized boats. Some channels in both segments, however, are too shallow for motorized boats during periods of low flows. The next launch ramp is in Gridley, downstream of the informal launch at the Palm Avenue entrance.

Popular activities in Segment 3 (other than bank and boat fishing) include hunting, picnicking, and camping. Because the OWA includes both sides of the river along this segment, there is little development along the shoreline, making for a quiet and relaxing experience on the river downstream of the Afterbay outlet (which in contrast, is periodically congested). In addition, this segment provides excellent opportunities for viewing wildlife such as ducks, egrets, herons, and even pelicans (Figure 5.2-4).

Figure 5.2-4. Pelicans on Segment 3.



Source: EDAW 2003.

5.2.2 Characterization of Lower Reach User Group

The characterization of the lower reach user group is based on sixteen mailback survey respondents and five whitewater focus group participants who filled out the lower reach section of the focus group survey and answered questions in the focus group discussion about the lower reach.

Most respondents are not frequent users of the lower reach, with most boating between one and ten days per year on any of the segments and only a few people boating over ten days per year. Most respondents use Segments 2 and 3. Out of the total number of respondents (21), eight people use Segment 1, 15 people use Segment 2, and 16 people use Segment 3. Of the Segment 3 users, most of them also use Segment 2, and a few use both Segments 1 and 2 as well. Segment 1 (the Diversion Pool) has only non-powered use, and kayaks are a popular craft choice. Segment 2 respondents also use mostly non-powered craft such as kayaks, rafts, or drift boats. Of the fifteen respondents that use Segment 2, eleven respondents use non-powered craft, one uses both non-powered and powered craft, and three respondents use powered boats only. Segment 3 has slightly more powered boat use, though of the sixteen respondents that use Segment 3, ten respondents use non-powered boats only, two use both powered and non-powered boats, and four respondents use powered boats only. Table 5.2-1 summarizes respondents' use of the three lower reach segments and the craft they usually use on each segment.

Table 5.2-1. Respondents use of lower reach segments and usual craft.

Segment	Number of Respondents		Days per year Respondents Boat on Segment	
	Boat on Segment	Usual Craft	Average	Range
1	8	Kayak – 7 (88%) Canoe – 1 (12%)	6	1-24
2	15	Kayak – 5 (33%) Canoe – 2 (13%) Drift boat – 5 (33%) Jet boat – 2 (13%) Powerboat – 1 (7%) Fishing boat – 1 (7%) Inflatable raft – 2 (13%)	12	1-40
3	16	Kayak – 4 (25%) Canoe – 1 (6%) Drift boat – 7 (44%) Jet boat – 5 (31%) Powerboat – 1 (6%) Inflatable raft – 1 (6%)	11	1-50

¹ Some respondents marked more than one craft type.

N=21.

Source: EDAW 2003.

In addition to their type of use, respondents were asked when they typically boat on the lower reach. Most of the respondents use Segment 1 in the spring, summer, and fall and use Segments 2 and 3 during the summer and fall mostly. Table 5.2-2 shows the number of respondents who use each segment and in what season(s).

Table 5.2-2. Season of use by lower reach segment.

Segment	Respondents that Use Segment	Respondent Use by Season ¹			
		Spring	Summer	Fall	Winter
1	8	5 (63%)	7 (88%)	5 (63%)	2 (25%)
2	15	4 (27%)	11 (73%)	11 (73%)	5 (33%)
3	16	2 (31%)	12 (75%)	12 (75%)	4 (25%)

¹ Participants listed more than one season.

Note: N=21.

Source: EDAW 2003.

Respondents were also asked to indicate their primary put-in and take-out locations (Table 5.2-3). Segment 1 has only one put-in, located on Burma Road, and all respondents use this put-in. Over half of Segment 2 respondents use put-ins at either Riverbend Park above the Highway 162 bridge, or at the Fish Hatchery upstream of the Table Mountain Boulevard bridge. Other put-ins listed include Bedrock Park, the private River Reflections Campground, and the Afterbay outlet. One respondent listed the OWA, but was not specific as to where in the OWA.

Table 5.2-3. Usual put-in by lower reach segment.

Segment	Respondents that Use Segment	Usual Put-in	Respondents that Use Put-in	
			Number	Percent
1	8	Burma Road	7	88
		NA ¹	1	12
2	15	Fish Hatchery	4	27
		By Hwy 162 bridge	3	20
		Riverbend Park	2	13
		Bedrock Park	1	7
		OWA ²	1	7
		River Reflections	1	7
		Afterbay outlet	1	7
		NA ¹	2	13
3	16	Vance Avenue	4	25
		Afterbay outlet	3	19
		Bedrock Park	2	13
		Fish Hatchery	1	6
		OWA ²	1	6
		Charlie's Hole ²	1	6
		Unsure	1	6
		NA ¹	3	19

¹ NA = Not answered.

² This was the answer given, specific location of this put-in is unknown.

Note: N=21.

Source: EDAW 2003.

Finally, almost half of Segment 3 respondents put-in at the ramp near the OWA's Vance Avenue entrance or at the Afterbay outlet. Respondents also mentioned using put-ins at Bedrock Park and the Fish Hatchery, both of which are located in Segment 2. The OWA and "Charlie's Hole" were two put-ins that were mentioned, but respondents were not specific as to the exact location of these put-ins.

Segment 1 has one take-out located on Burma Road, and this is the take-out that all respondents use (Table 5.2-4). Almost one-third of the respondents for Segment 2 take-out at the Afterbay outlet, and almost half of the respondents take-out for Segment 3 at the ramps near the OWA's Palm or Vance Avenue entrances. Other take-outs listed were Gridley, "Charlie's Hole," and the OWA. Again, respondents were not specific as to where "Charlie's Hole" was or which ramp was used in the OWA.

Table 5.2-4. Usual take-out by lower reach segment.

Segment	Respondents that Use Segment	Usual Take-out	Respondents that Use Take-out	
			Number	Percent
1	8	Burma Road	7	88
		NA ¹	1	12
2	15	Afterbay outlet	4	27
		Riverbend Park	2	13
		OWA ²	2	13
		Fish Hatchery	1	7
		Bedrock Park	1	7
		Palm Avenue	1	7
		River Reflections	1	7
		NA ¹	3	20
3	16	Palm Avenue	4	25
		Vance Avenue	3	19
		OWA ²	3	19
		Charlie's Hole ²	1	6
		Gridley	1	6
		Not sure	2	13
		NA ¹	2	13

¹ NA = Not answered.

² This was the answer given, specific location of this put-in is unknown.

Note: N=21.

Source: EDAW 2003.

Lower reach respondents also answered questions on the typical group with whom they boat with on any of the segments. Most respondents boat with two to three other people, and approximately 70 percent of the respondents boat with family and/or friends. Table 5.2-5 summarizes the characteristics of respondents' typical group.

Table 5.2-5. Lower reach respondents' group characteristics.

Group Size	Number of Respondents per Group Size		People in a Typical Group	Number of Respondents per Typical Group	
	Number	Percent		Number	Percent
1 (only me)	3	14	I am usually alone	2	9
2-3	14	67	Family only	2	9
4-5	2	9	Family and friends	9	43
6-10	0	0	Friends only	4	19
11-15	1	5	Organized group	1	5
15+	1	5	Clients	3	3

Note: N=21.

Source: EDAW 2003.

While boating on the lower reach, many respondents also fish and view wildlife, as the Feather River is considered an excellent place to fish for salmon and steelhead as well as see wildlife such as egrets, ducks, and turtles. Several respondents also engage in photography, hunting, or picnicking while boating on the lower reach segments. Table

5.2-6 lists non-boating activities that respondents participate in on the lower reach while they are boating and how many respondents participate in each activity.

Table 5.2-6. Other activities that respondents participate in on the lower reach while boating.

Activity	Respondents ¹	
	Number	Percent
Fishing	15	75
Wildlife viewing	11	55
Photography	7	35
Hunting	5	25
Picnicking	5	25
Sunbathing	4	20
Swimming	4	20
Other ²	1	5

¹ Respondents could mark more than one activity.

² Includes running and mountain biking the road and trails by the Diversion Pool.

Note: N=20.

Source: EDAW 2003.

Due to the popularity of the Feather River, particularly for fishing, many guide services are available. The mailback respondents were asked about whether or not they participated in a guided trip on the lower reach and whether they had led a guided trip on the lower reach. One third of respondents have taken a guided trip, most on Segment 3 (Table 5.2-7). Only four respondents have led a guided trip, all of which were on Segments 2 and 3 only. All four of these respondents are currently active guides.

Table 5.2-7. Number of respondents who have taken or led a guided trip on the lower reach.

	Have you ever taken a guided trip?	Have you ever led a guided trip?
No	10 (67%)	11 (73%)
Yes:	5 (33%)	4 (27%)
Segment 1	0	0
Segment 2	1	4
Segment 3	5	3

Note: N=15.

Source: EDAW 2003.

5.2.3 Issues on the Lower Reach

Several issues regarding boating on the lower reach were identified in the lower reach survey and focus group discussion. These issues were categorized as access, flow, or general boating issues. Access was the only issue identified for Segment 1, while users reported issues in all three categories for Segments 2 and 3. Not all issues are

specifically boating-related. In the interest of reporting all study results, however, non-boating issues are listed and discussed in the categories in which respondents listed them.

5.2.3.1 Segment 1: Diversion Pool

Three responses related to access were identified for the Diversion Pool in the focus group discussion, but only one response was noted in the mailback survey. Table 5.2-8 lists respondents' exact comments by issue category.

Mailback survey respondents and focus group participants were concerned about the steep launch area on Burma Road, the only boat launch access on the Diversion Pool. Focus group members mentioned the drop between the water and the bank edge, which makes it difficult to launch a boat there. Many feel the launch is too steep to allow an easy put-in.

Focus group members mentioned two other facility-related access issues, one dealing with the entrance gate and the other with grazing. Focus group members like to paddle after dark, especially when there's a full moon, but the entrance gate to the Diversion Pool closes at sunset, forcing boaters to leave by sunset. This area is also designated as a day-use only DUA. In addition, focus group members would also like to have access to a grazing-free area to picnic. Focus group members said that there are currently only two boat-accessible picnic areas and it is hard to find a spot that is free of cow manure.

Table 5.2-8. Segment 1 respondents' stated issues.

Access Issues	
☞	Boat launch areas too steep to allow easy access to the water.
☞	One put-in/take-out with three to four foot drop from edge of the bank to the water.
☞	Gate closes at sunset.
☞	Hard to find a picnic spot due to cow manure.
Flow Issues	
☞	(none)
General Boating Issues	
☞	(none)

Source: EDAW 2003.

5.2.3.2 Segment 2: Feather River from the Fish Barrier Dam to the Thermalito Afterbay Outlet

Both survey respondents and focus group members identified access, flow, and general boating issues associated with Segment 2. Access issues include the lack of developed boat ramps/take-outs along Segment 2, while flow issues primarily concern the low flow

in this section of the river. General boating issues include fishing regulations, vehicle safety, facilities available and jet boat use. Table 5.2-9 lists respondents' exact comments by issue category.

Four respondents identified issues associated with access along Segment 2. Throughout this segment, there are no publicly accessible paved boat ramps. All of the boat ramps along this segment are gravel or dirt. Though there is a paved ramp at Riverbend Park, permission from the Feather River Recreation and Parks District and a key to the gate are required to use this ramp. Dirt or gravel informal ramps are located near the Fish Hatchery, at Bedrock Park, and just below the Highway 162 bridge over the river; however, these do not provide easy put-in or take-out. The Afterbay outlet is an extremely popular fishing location during certain times of the year, and the ramp located just upstream of the outlet is relatively steep and generally useable only by 4WD vehicles. Sometimes non-4WD vehicles try to launch here and cannot get back up the ramp without assistance, especially after it has been raining and the launch is muddy.

Table 5.2-9. Segment 2 respondents' stated issues.

Access Issues
€ Steep launch ramp at Outlet.
€ Lack of developed boat launch ramps.
€ No take-out to avoid Outlet.
€ No portage/take-out to avoid whitewater section.
Flow Issues
€ Not enough salmon, steelhead, striped bass.
€ No fish biting.
€ Water isn't cold enough to sustain year-round trout population.
€ Forces fish to bunch up in deep pools.
€ Riffles too shallow to navigate.
General Boating Issues
€ Jet boats.
€ Not enough toilets.
€ More tent camping.
€ No phone, no one to ring to save somebody.
€ Salmon snagging, vehicle vandalism.

Source: EDAW 2003.

Focus group members also identified other issues regarding access, mainly the need for more take-outs. For example, in Segment 2 there is a section of the river sometimes referred to as the "Islands area" or "S'es" because of the S shape of the river (pers. comm., Huber 2003). This is a Class II whitewater section and is beyond the capability of the novice flatwater boater. However, there is no portage or take-out upstream (or put-in downstream) of this stretch to allow boaters to bypass this whitewater section. IN addition, the Afterbay outlet is also intimidating to some boaters if there is a substantial amount of water being released from the Afterbay or if anglers are crowded around the outlet. Flatwater boaters could use the outlet ramp as a take-out, but it is very close to

the congested area and can be congested itself and therefore is not a take-out that would help boaters avoid the outlet area.

Out of the nine people that completed the mailback survey for Segment 2, five of them felt that there were flow issues on this segment and that the flow was too low. This segment of the river is also called the low flow section because the minimum flow from the Diversion Dam is 600 cfs. Four of the five issues focus on perceived negative effects of this flow on the fish and fishing in this segment. The other issue mentioned regarded navigation. The respondent felt that because of the low flow, the riffles were too shallow to navigate.

Finally, respondents identified general boating issues in Segment 2. One respondent mentioned anglers snagging fish on the river from the Table Mountain Bridge down to the Afterbay outlet, which is not a legal way to catch a fish in California. Snagging fish (also called foul-hooking) is where a hook is dragged through the water to catch a fish. The fish does not take any bait, it is simply hit by the hook and caught externally. This is popular on the Feather River because there are so many fish, making it easy to put a hook in the water and hit a fish. It is difficult for State Game Wardens to prosecute snagging because it is an easy technique to mask. Wardens are more successful at prosecuting anglers for keeping a fish that has not been caught in the mouth (pers. comm., See 2003).

One respondent mentioned the issue of vehicle vandalism, occurring from the Table Mountain Bridge down to the Afterbay outlet. In terms of facility issues, one respondent felt there was a lack of tent camping along this segment as well as a lack of telephone availability for emergency use. In addition, focus group members felt there was a lack of toilet facilities in this segment.

Focus group members also felt that the jet boats on the river were an issue. Participants felt that the loud noise generated by jet boats disrupts the setting of the river. Some focus group members also felt that jet boats were annoying to anglers because they often park where other people are trying to fish.

5.2.3.3 Segment 3: Feather River from the Thermalito Afterbay Outlet to Gridley

As with Segment 2, Segment 3 respondents identified access, flow, and general boating issues. In Segment 3, access issues primarily involve the availability and condition of launch ramps; flow issues focus on the water levels and associated perceived impacts to fishing. Segment 3 general boating issues deal with snagging fish, unsafe boaters, bank anglers, and vehicle safety. Table 5.2-10 lists respondents' exact comments by issue category.

Table 5.2-10. Segment 3 respondents' stated issues.

Access Issues	
€	Trouble getting boat in water due to bad road launch ramp.
€	No public ramp available below Palm Avenue.
€	No boat ramps.
€	Difficult launch ramps.
€	No take-out at end of OWA.
Flow Issues	
€	Cannot run boat on rocks, need water.
€	Too much fluctuation.
€	Not able to boat as much as in the past.
€	Shallow water, need jet boat.
€	Lack of fish.
€	No fish biting.
General Boating Issues	
€	Salmon snagging.
€	Snagging fisherman.
€	Unsafe boaters.
€	Bank anglers verbally harassing, poaching.
€	Boaters not qualified to use a jet boat.
€	Vehicle vandalism.
€	High speed jet boats endanger low powered craft.
€	Snaggers all along bank.
€	Too much fishing line in water.
€	Vehicle vandalism at Outlet parking.
€	Unruly bank fishermen.

Source: EDAW 2003.

Access issues identified for Segment 3 primarily address boat ramps. Two respondents mentioned the difficulty of using the existing launch ramps in this segment. Below the Afterbay outlet, all of the launch ramps are unpaved and informal. It can be difficult to launch out of dirt or gravel ramps in a vehicle that is not 4WD, especially after rain has made these ramps muddy. There are relatively few informal ramps in this segment of the river. There is one at the Vance Avenue entrance and one at the Palm Avenue entrance to the OWA. One respondent noted that there was no public ramp available below Palm Avenue; however, most of the river after Palm Avenue is out of the study area. Focus members also noted that there is no take-out at the downstream end of the OWA, though the Palm Avenue take-out is relatively close to the end of the OWA.

Several respondents also felt there are issues related to flow rates on Segment 3. All respondents who identified issues felt that flow is too low in this segment. Respondents reported difficulty boating in water that is too low. In addition, one respondent felt there was too much fluctuation in the flow in this segment, and two respondents felt the flow had negative effects on fishing.

General boating issues on Segment 3 focus on fishing regulations, unsafe boaters, bank anglers, and vehicle vandalism. There were comments again related to the issue of anglers snagging fish, and one comment about fishing line in the water due to “bead” fishermen. Bead fishing uses plastic beads that look like fish eggs on a long leader (fishing line) with a hook and weight attached to the end of the line. Several comments dealt with the issue of unsafe boaters, particularly jet boaters. Respondents felt that jet boaters were unsafe and endangered other smaller boats. Comments regarding bank anglers were focused on their behavior at the Afterbay outlet. When it is congested at the outlet, the situation can become extremely tense, resulting in fights and other hostile behavior toward other users. This type of behavior has resulted in the outlet area becoming referred to as a “combat fishing” area. In addition, respondents also mentioned vehicle vandalism at the outlet in particular. Due to a lack of staffing, the parking areas are seldom patrolled by DFG. Furthermore, the area lacks security features such as lighting or telephones at parking areas along the river.

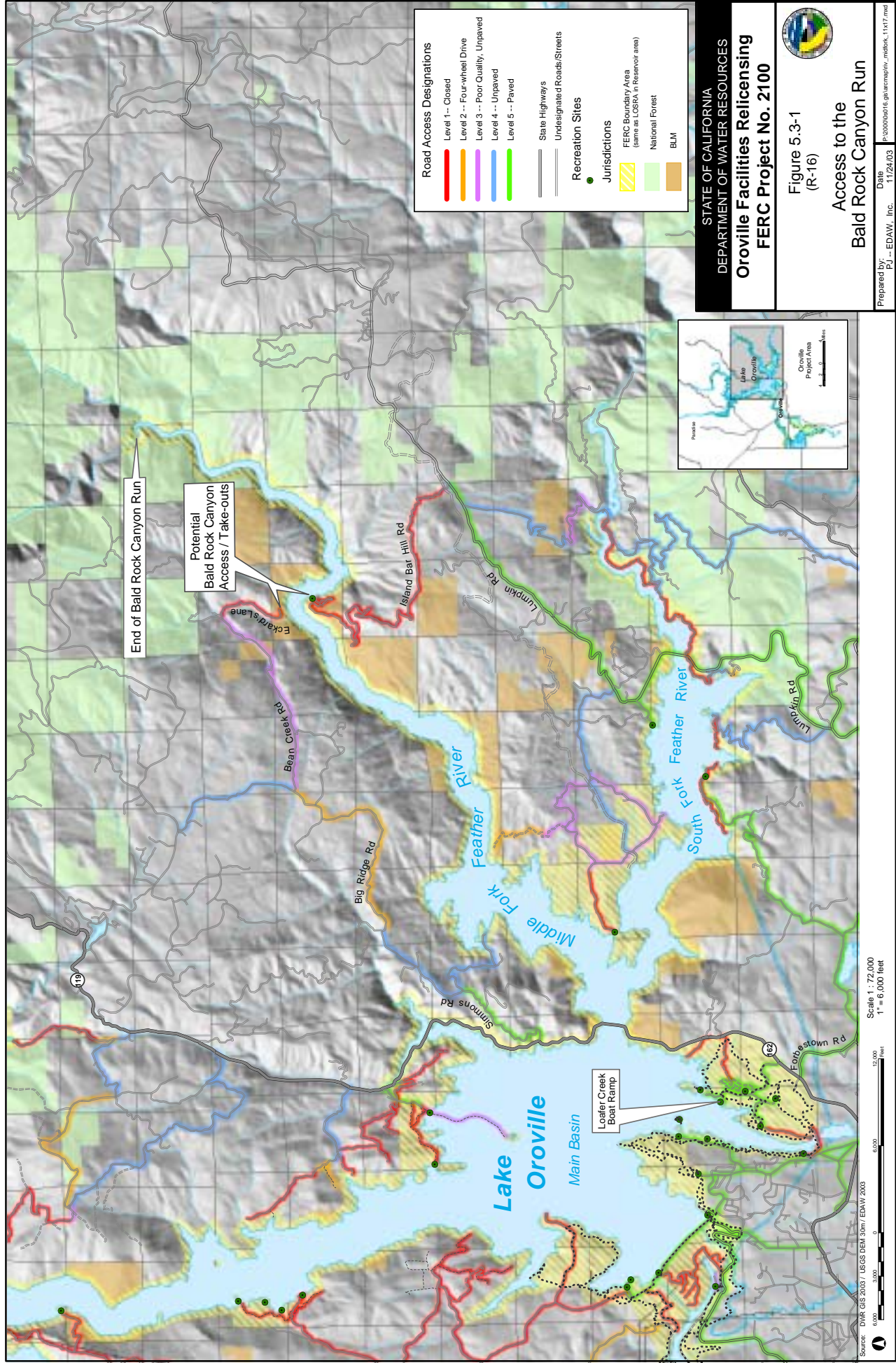
5.3 MIDDLE FORK FEATHER RIVER

One focus group member identified access issues related to the MFFR and the Bald Rock Canyon whitewater run. According to Holbeck and Stanley, the “Bald Rock Canyon is one of the most spectacular canyons in California,” (1998). The Bald Rock Canyon run begins at Milsap Bar (outside of the Project 2100 boundary), 6.5 miles north of the tip of the Middle Fork arm of Lake Oroville. The run ends where the Middle Fork of the Feather River meets the Middle Fork arm of Lake Oroville (Figure 5.3-1). From the confluence of the reservoir and the MFFR, it is a three to four hour paddle out to reach the Loafer Creek Boat Ramp, the nearest take-out (Holbek and Stanley 1998). The entire run, except for the paddle to the take-out at Loafer Creek is outside of the Project 2100 boundary. The Bald Rock Canyon run is categorized as Class V+ and is extremely difficult. There is no developed or maintained public road access on the Middle Fork arm of Lake Oroville. The focus group member said that when the reservoir was created, it inundated a bridge between Bean Creek Road and Island Bar Hill Road, which provided a public access point. Currently, all roads near the Middle Fork arm of the reservoir are private.

The focus group member stated that kayakers that do this run take out at a point they call “Wayne’s Place,” where they walk their boats approximately one mile uphill to their cars, which are parked at a private residence off of Eckards Lane, a private road. The focus group member believes that a public access easement on Eckards Lane could provide public access to this take-out. Another potential access location mentioned was Island Bar Hill Road, which is also a private road. A third potential access point mentioned was a road in Plumas National Forest (road 20N59). The focus group member stated that access to the water from this road is currently unsuitable for vehicles and the road is overgrown. Existing Forest Service and USGS topographic maps were unable to confirm that this road actually reaches the shoreline. This focus

Figure 5.3-1. Access to the Bald Rock Canyon Run

11X17 insert



Back of Figure 5.3-1.

group member believed that the Forest Service road could be cleared and used as a take-out for this run, shortening the paddle out by several hours.

The Bald Rock Canyon run is extremely difficult and probably boated by very few people. The run includes a portage around Atom Bomb Falls, “a 40-foot falls formed by apartment house-sized boulders,” (Holbek and Stanley 1998). The portage can be dangerous and requires “a rappel down a 10-foot waterfall,” (Holbek and Stanley 1998). Only expert boaters could do this run and therefore the levels of use and demand for this run are probably very low, especially with such a long paddle out. There are other difficult runs available on the Upper North Fork Feather River which have much better access and would not require such an extensive paddle out.

5.4 STAKEHOLDER-PROPOSED WHITEWATER PARK

An idea for future development in the Oroville area, brought forward by stakeholders in the Oroville Facilities Relicensing Collaborative, is a “whitewater park.” A “whitewater park” is a designated segment of water that has whitewater run qualities (i.e., rapids) where whitewater activities such as rafting and kayaking, including slalom and/or rodeo boating, take place. Whitewater parks can be in either augmented natural whitewater runs or in man-made runs. These parks often involve more than a stretch of water; the land adjacent to the whitewater run can be improved to include trails, land parks, and areas for spectators to watch the boaters. There are many whitewater parks located all over the world, including 20 located in urban areas of the United States (Reimers 2002). The City of Reno (approximately 100 miles from Oroville) opened a whitewater park in November 2000 on the Truckee River. The focus group discussion and the survey generated preliminary ideas for potential park features, usage, and locations.

5.4.1 Possible Features of a Potential Whitewater Park in the Oroville Area

The focus group had several ideas on what a whitewater park in the Oroville area might contain in terms of both whitewater activities and land-based support facilities. The focus group members believed that a park in the Oroville area could provide a combination of whitewater activities, primarily slalom and rodeo boating. Slalom boating requires passing through gates in a specific order either going upstream or downstream. Rodeo boating is more performance and show-oriented, and involves boaters remaining in a river hydraulic feature or “play hole” and doing flips, spins, and twists for a period of time (Figure 5.4-1). Focus group members cited parks in Augsburg, Germany; Sydney, Australia; and Durango, Colorado as examples of other park locations where slalom and rodeo boating are both provided in the same park. Commercial rafting at the whitewater park could also be included as an activity for people who do not otherwise participate in whitewater activities. Focus group members felt the whitewater park could be designed for all levels of whitewater experience.

Figure 5.4-1. Example of rodeo boating.



Source: Northeastern Whitewater USA website.

Focus group participants believe non-whitewater activities such as fishing and boating could still take place on waters within the park. In addition, diverse activities such as picnicking and frisbee were mentioned by focus group members as activities that could take place on the shore around the whitewater park. Facilities such as walking trails, bike paths, horseback riding trails, campgrounds, bathrooms, and food concessions could also be included in the park. In addition to these activities, focus group members mentioned the importance of spectators and felt that it was important to have contests, demonstrations, and classes the public could watch, and an area provided for them to do so. Other activities or events that focus group members listed in the survey included: a surf wave (see Glossary for definition), a festival, whitewater awareness events, safety training including swift water rescue, and “whatever makes it economically viable.” Focus group members felt that the desires of potential park users should be studied, along with the economic feasibility of such a facility in the Oroville area, and that any facility should ultimately provide the most-desired features.

5.4.2 Usage of and Demand for a Whitewater Park

To obtain a preliminary estimate of the level of demand for a potential whitewater park, focus group members were asked, “What level of regular use do you think such a whitewater park would receive?” Out of 11 participants, nine participants thought a potential whitewater park would have a high amount of use and two participants thought it would receive a medium amount of use.

The reasons for high use estimates were the park’s location and time of use. Several participants commented that there are many local paddlers in the area who would use the park. Due to the park’s urban location, participants felt that paddlers could visit the

park after work and boat without a partner, which is generally considered unsafe.. Due to the urban location of the park, however, focus group participants felt that there would be a high probability of other people boating at the same time, relieving the need to boat with a partner. The park would also be close to amenities in the City of Oroville; to Chico State University, which could use the park for classes and trips; and near other whitewater opportunities being enhanced in areas undergoing hydro-relicensing. Participants felt that enhancing whitewater opportunities on the Big Bend run in conjunction with the whitewater park could also contribute to high use of the park. Two participants commented on the timing of use at the park, remarking that as spring flows decrease, there are limited whitewater opportunities in California, and the park would offer regular whitewater recreation when few other opportunities existed. One participant felt this would contribute to high use from summer to late fall. During the discussion, focus group members concluded that peak use would be in July, August, and September, with use declining in the winter due to colder weather.

Of the two participants who felt the park would receive medium use, only one gave a reason. This participant felt use would depend on design; if the park were designed similar to the one in Penrith, Australia, a regular rafting operation could be feasible that would boost use by non-whitewater recreationists.

Focus group members estimated that there would be 300 to 500 visitors per day at the park on a weekend, provided that the park was developed in conjunction with improvements to the Big Bend run. Focus group members indicated that there is a need to gather information from other whitewater parks to better determine what usage could be expected at a whitewater park in Oroville.

In terms of their own usage of a potential whitewater park in Oroville, the survey asked focus group members, "How often would you use such a whitewater park?". Table 5.4-1 lists the response choices and the results. Most participants would visit the park either once a week or more, or once every two weeks. Only one individual's usage would depend on the entry fee. Additionally, one participant wrote in that usage would be based on the level of skill required.

Table 5.4-1. Focus group participants projected individual use of a potential whitewater park in the Oroville area.

Amount of Use	Number of Participants
Once a week or more	6
Once every two weeks	3
Once a month	0
Once every two months	0
Less than once every 2 months	0
Depends on entry fee	1
Written-in response: Depends on the level of skill required	1

Note: N=11.

Source: EDAW 2003.

Focus group members also thought that non-whitewater recreationists would be attracted to the park. They felt the park would be an additional recreation site for people visiting Oroville, and would set Oroville apart from other reservoir-based recreation sites in the surrounding area. Focus group members felt that non-whitewater visitors could attract commercial rafting and spectators for whitewater activities and events.

5.4.3 Locations for a Potential Whitewater Park in the Oroville Area

As a result of meetings with two of the country's top whitewater park designers, Gary Lacy and John Anderson, focus group members identified four sites as potential locations for a whitewater park in Oroville. Three of these sites are on the Feather River downstream of Oroville Dam including: the area just below the Thermalito Diversion Dam, an area just below Fish Barrier Dam, and a site on the low flow section of the Feather River between the Fish Barrier Dam and Bedrock Park (Figure 5.4-2). The fourth location is along the tail channel between the Thermalito Forebay and Thermalito Afterbay (Figure 5.4-3). At all of these locations, the whitewater park would be in an artificially created channel next to the existing river channel. Focus group members acknowledged that operation of such a facility would require forgoing some power generation at the Diversion Dam or the Thermalito Powerplants.

Focus group members also felt that by locating the whitewater park at one of the river locations, it could contribute to development of Oroville's river waterfront. However, focus group participants felt there may be conflicts with fishermen at the site in the low flow section of the Feather River between the Fish Barrier Dam and Bedrock Park.

Location of the park could also affect the park's operating hours. Focus group members felt that it would be best if the park were available for use during the entire week, but speculated that power generation losses would be lowest if the park ran only on weekends. If the park were located such that it did not interfere with power generation (e.g., at sites below the Fish Barrier Dam), it was believed more likely that the park could be open all week.

Figure 5.4-2. Potential Locations for Whitewater Park along the Feather River.

8.5 x 11 insert

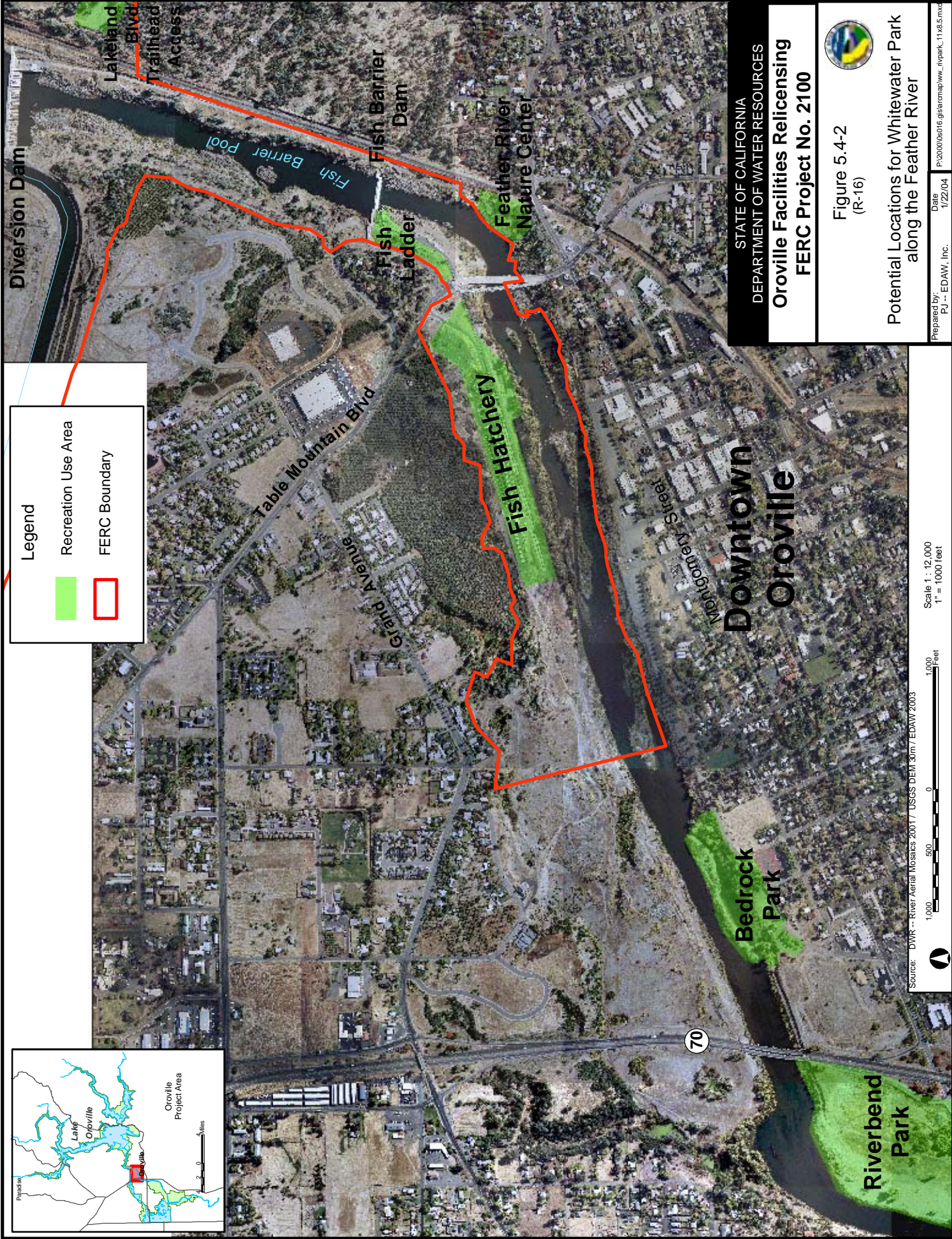
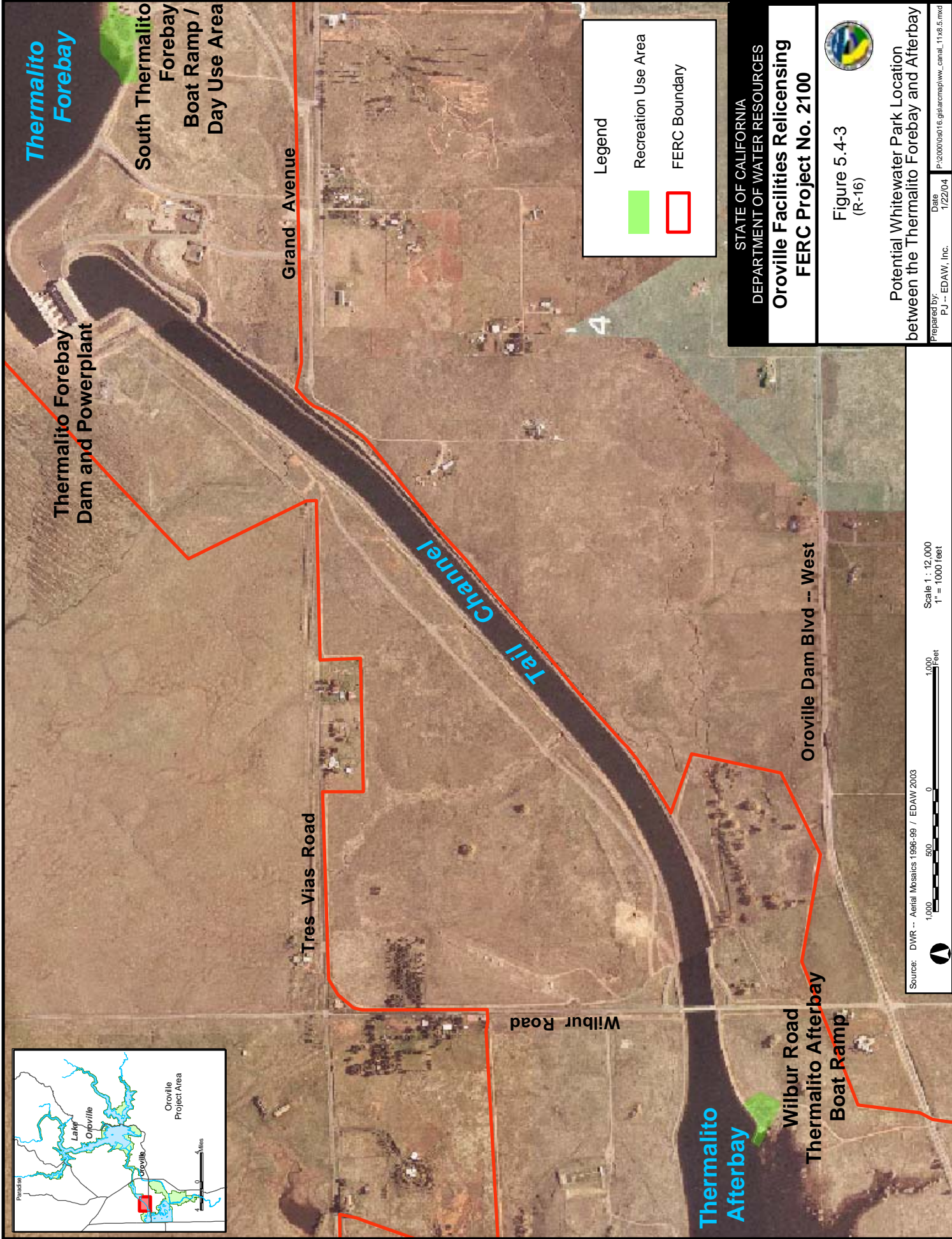
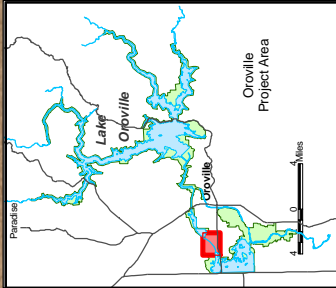


Figure 5.4-3. Potential Whitewater Park Locations between the Thermalito Forebay and Afterbay.

8.5 x 11 insert



Legend

Recreation Use Area

FERC Boundary

STATE OF CALIFORNIA
DEPARTMENT OF WATER RESOURCES
**Oroville Facilities Relicensing
FERC Project No. 2100**



**Figure 5.4-3
(R-16)**

Potential Whitewater Park Location
between the Thermalito Forebay and Afterbay

Prepared by:
PJ -- ED&W, Inc.

Date
1/22/04

P:\2000\06016.gis\arcmap\vw_canal_11x8.5.mxd

Source: DWR -- Aerial Mosaics 1996-99 / ED&W 2003



Scale 1 : 12,000
1" = 1000 feet

6.0 CONCLUSIONS

This section addresses the whitewater and river boating-related issues and concerns that were identified by survey respondents and focus group members, as presented in the previous section. Possible actions to address these concerns are presented. The primary possible actions for the upper reach include providing flow information and better take-out access. The primary possible actions for the lower reach include improving launching access; increasing flow; increasing DFG patrol; adding more toilet and trash facilities; and providing better maps and information on the location of boat ramps, access roads, and other facilities along the river. This report was prepared under the direction of DWR staff. Opinions, conclusions, and findings expressed in this report are those of the authors. This report does not express the official position of the DWR unless approved by the Director or his designee.

6.1 UPPER REACH

The following discusses possible actions to address the issues and concerns regarding boating on the upper reach, including flows, reservoir elevation, and access. The primary actions that could improve the upper reach include providing flow information and better take-out access. In addition, general recommendations and conclusions are presented regarding potential improvements along the upper reach.

6.1.1 Flows on the Big Bend Run

There are changes in flow on the upper reach that can occur as a result of releases out of PG&E's Poe Powerhouse. Therefore, it would benefit whitewater boaters on the Big Bend run to have access to current and scheduled flow conditions for the NFFR below Poe, in order to know if the run is boatable. Currently, PG&E is not releasing this information to the public. It is unknown at this time if there are plans for PG&E to begin making this information public or if they would consider doing so. Due to the Poe Powerhouse not being under DWR jurisdiction, PG&E is the entity responsible for making information available on the flow released from the Poe Powerhouse. Although real-time information would improve the existing situation, focus group members also noted that forecasted flow information would be more useful. Forecast information would alert boaters to anticipated flow fluctuations and help them determine ahead of time if the Big Bend run was boatable or not.

6.1.2 Lake Elevation and Availability of the Big Bend Run

Unlike most whitewater runs that depend on flow levels for availability, the availability of the Big Bend run primarily depends on Lake Oroville elevation. As the reservoir gets lower, more and more of the run is exposed. Although lower reservoir levels are better for whitewater boaters, other recreational uses generally do not benefit from lower reservoir levels. Many boat ramps become unusable; boat-in campsites become

difficult to access; and the reservoir becomes smaller, narrower, and potentially more congested. It is also not as aesthetically appealing compared to when the reservoir is at higher elevations, thereby impacting general recreational use of the reservoir. However, it is not expected that the reservoir level would be lowered solely for the purpose of exposing this whitewater run; the Big Bend run would continue to be available only when normal project operations result in drawdown of the reservoir.

6.1.3 Access to the Big Bend Run

When the Big Bend run is boatable, the long flatwater paddle to the take-out at Dark Canyon Car-top BR can be a deterrent for some whitewater boaters. One way to shorten the paddle-out would be to locate and develop a new access road and take-out closer to the final rapid. Locating such a route was attempted during field reconnaissance. Attempts focused on roads on the south and west side of the North Fork arm of Lake Oroville, as these roads would be closest to the put-in, eliminating the need for boaters to drive around the reservoir in order to return to their cars at the put-in. No public roads were found that went to Lake Oroville, nor were any found that could be reasonably extended to reach significantly nearer to the shore.

One potential access road evaluated was Poe Powerhouse Road, which originates in the Plumas National Forest and runs along the north side of the North Fork (Figure 5.1-1). This road, however, is no longer drivable. Focus group members felt this road was a possible access road, but only if it linked up to the Poe Powerhouse put-in. The USGS topographic map indicated that the two roads were linked. Field reconnaissance found that this is not the case, however, found that this is not the case: there are railroad tracks where the road should connect to the put-in and there is no road alongside them. Ownership (several adjacent landowners), cost, and engineering issues pose challenges to making the Poe Powerhouse Road drivable, connecting it to the put-in at PG&E's Poe Powerhouse, and maintaining it. Also, upgrading the Poe Powerhouse Road in this otherwise roadless area could change the scenery and activities available on the North Fork arm of Lake Oroville. Adding traffic and more people to this relatively quiet, semi-primitive area could dramatically change the visitor experience and thus be taken into consideration.

Other potential alternatives include access from Poe Powerhouse Road at French Creek where the road is still drivable (Figure 5.1-1). Though this offers a feasible take-out, the road here is rough (4WD only) and very steep from the creek to the road. It would take approximately 2 hours to drive out of the National Forest, back to Oroville and then back around to the put-in to shuttle cars. Another potential take-out access point is the road to Berry Creek. However, when field reconnaissance was done, this road was not drivable due to a washed out culvert. Furthermore, this road is a rough 4WD road, and it would also take boaters approximately 2 hours to drive back to Oroville and back up around the reservoir to the put-in. Due to its impassability, it is not known how close the Berry Creek Road goes to the lake nor how difficult it would be to

access the road from the reservoir. Although these two roads are potentially feasible access points, they are not practical. Though take-out at these locations would significantly reduce the paddle-out time, it would increase driving time and cost, and would not reduce the overall trip time. Therefore, these options would probably not be used by whitewater boaters.

As there are no practical land-based ways to reach the end of the whitewater run, a water shuttle may be the only other way to cut down the paddle-out time. A water shuttle would involve a boat going to pick up the whitewater boaters at the end of the run and towing or transporting them to the take-out at Dark Canyon. The shuttle boat would most likely leave from the Lime Saddle Marina or Boat Ramp, and could pick up the whitewater boaters at either French Creek or Berry Creek. Depending on the reservoir elevation, there may be some paddle-out time to get to French Creek or Berry Creek; however, the paddle-out would be much less than the seven mile or more paddle-out to Dark Canyon that boaters have been doing. From either shuttle boat pickup location, the shuttle boat would collect boaters and tow their boats back to Dark Canyon. Boaters would continue to run their own vehicle shuttles between the put-in and take-out. Members of the focus group stated they were willing to pay \$5 to \$10 per boater per tow for the water shuttle.

One alternative would be a boater-run water shuttle where the boaters would be responsible for organizing the water shuttle, including possibly contracting directly with an existing (such as Lime Saddle Marina) or new concessionaire. Alternatively, DWR or California Department of Parks and Recreation (DPR) could contract the shuttle services to an existing or new concessionaire. The water shuttle would likely only run on weekends when there would be several boaters to pick up, and it is unlikely that the shuttle would be run very often due to the conditions necessary for boaters to boat the run. The user group feels that the reservoir has to be at 730 feet or less before Big Bend is runnable, and boaters have only been boating this run between September and November. Using these two criteria, since 1988 (when participants began boating on the run), Big Bend has only been runnable for 63 weekends (both Saturday and Sunday) out of a possible 728 (less than 10 percent of weekends). During a typical runnable year, the shuttle would only run 13 weekends if boaters were out every weekend from the beginning of September to the end of November. The shuttle service could be scheduled, but logistics would have to be worked out with boaters as to how the shuttle operator would know when to run the shuttle, when to pick boaters up, and how many people would need to be picked up.

Providing a water shuttle may have effects on the number of people that boat on Big Bend. The focus group was asked, "What is the potential size of the user group for this run and what would happen if improvements were made (e.g., a water shuttle)?" The participants responded that if there were a shuttle running on the weekends, then the Big Bend run would evolve from a local run to a more generalized run. On a typical runnable weekend, about 10 people boat the run; with improvements, there could be a

considerable increase in this number. Although the Big Bend run is currently a local run, with a shuttle and a guarantee that Big Bend would be runnable for both days on the weekend, “people would start coming from all over, even the Bay Area” (WFG 2003). However, runnable flows cannot be guaranteed without agreement with PG&E on minimum flows, at least.

A substantial increase in users could have repercussions on the level of services that would need to be provided at the put-in and take-out (e.g., toilets, parking, signage, law enforcement), as well as the number of shuttles that would be required on weekends to handle increased demand. The season of use may also expand from increased use and additional facilities. The visitor experience would also change on the North Fork. Currently, the North Fork arm of Lake Oroville is a fairly quiet, low use area of the reservoir. It should be noted that any new facility needs at the put-in would be the responsibility of PG&E and that coordination between DWR and PG&E would be essential for any successful whitewater enhancement program on the Big Bend run.

6.1.4 Other Upper Reach Conclusions

Other recommendations for improving the whitewater opportunities on the Big Bend run include removing the large metal debris at the put-in and elsewhere along the run. As previously mentioned, metal stakes, pieces, and bars can be found near PG&E's Poe Powerhouse put-in and other places along the run, along with other hazardous trash articles. Safety would be improved if these were properly removed and discarded. However, it would be the responsibility of PG&E to clean up the put-in and portions of the river on their property.

6.2 LOWER REACH

The following discusses possible actions to address the issues identified on each of the three lower reach segments by focus group members and lower reach survey respondents. The primary actions that could improve river boating on the lower reach include improving launch access, increasing flow, increasing DFG patrols (for security reasons in the OWA and to stop illegal fishing on the river), providing additional toilet and trash facilities, and providing better maps and information on the location of boat ramps, access roads, and other facilities along the river. In addition, general recommendations and conclusions are presented regarding potential improvements along the lower reach. Not all issues are specifically boating-related; however, in the interest of reporting all study results, non-boating issues and corresponding possible actions are listed and discussed in the categories in which respondents listed them.

6.2.1 Segment 1

Issues identified regarding Segment 1 focus on access, including launch access, the entrance gate, and grazing areas. Respondents suggested constructing gradually sloping launch areas or 20 feet of stairs down into the water to facilitate boat launching. Filling in, regrading, and reinforcing the bank may be the easiest way to improve the launch area.

In regards to the entrance gate, focus group members felt that the gate is closed too early. DPR could consider leaving the gate open longer; however, this may result in other problems, such as the availability of staff to close the gate at a later time or undesirable public use of the Diversion Pool after dark, which would require an increased management presence in the area. DPR would have to weigh possible consequences and cost against the amount of boating use that could potentially occur at the Diversion Pool after sunset.

In terms of grazing, DWR currently has a grazing lease for 417 acres on the north side of the Diversion Pool and Spillway. This lease currently expires in September, 2004, and has previously been renewed for 5-year periods. If DWR and the lessee decided it was feasible, some areas for picnicking could be fenced off from grazing use. This would give boaters and trail users a manure-free area in which to picnic.

6.2.2 Segment 2

Respondents in Segment 2 identified access, flow, and general boating issues related to this segment. In terms of access, respondents felt that launch ramps are too few and too difficult to use. Respondents felt that improving existing ramps would help. The Afterbay outlet is the subject of a scheduled project to be constructed by the California Department of Boating and Waterways (DBW), DWR, and DFG. The project will involve paving the boat ramp and access road, thus allowing more types of vehicles to launch at the Afterbay outlet. The project is currently awaiting funding from the State budget. Other ramps could eventually be upgraded as well, perhaps including the improvement of informal ramps into established ramps with parking. This would allow boaters better access to more length of the river and more launching options than just at the outlet, especially when it is crowded.

In addition, small take-outs could be established on the east side of the river, off of the road originating from the OWA Pacific Heights entrance. Two take-outs are needed, one to portage around the whitewater section and one to avoid the Afterbay outlet. Boaters would also benefit from updated maps that show any boat ramps, take-outs, access roads, and toilet and garbage facilities, which would allow them to better plan their trips, coordinate shuttles, and better know their position on the water. These improvements may lead to an increase in boating use on this segment.

In addition to access issues, respondents identified flow-related issues regarding Segment 2. The flow in this segment is generally maintained between 600 and 700 cfs, and respondents felt this was too low. Respondents suggested increasing the flow, possibly to a minimum of 750 or 1,500 cfs, or increasing the flow through the salmon season only. Increasing the flow could result in improved fishing, better navigation, and more motorized boat use due to the resulting increase in river depth in the segment. However, increasing the flow could alter the setting of the river in this segment from a fairly peaceful area with low motorized use to a more popular fishing area with increased motorized use. It has also been speculated that higher flows alter the distribution of salmon, making them less likely to linger at the Afterbay outlet. The repercussions on management, management presence, and facilities that would be required to accommodate increased or changed use patterns, would need to be evaluated, as well as the change to the visitor experience on this segment. The effect on energy production would need to be evaluated as well.

Lastly, general boating issues related to Segment 2 involve fishing regulations, vehicle vandalism, facilities, and jet boats. Respondent suggestions included altering DFG fishing regulations, increasing patrols by DFG in the OWA for vehicle security and on the water to stop illegal fishing, providing more toilets, allowing the respondent to be host and hostess at the OWA camping area, and designating days when only non-motorized boating is allowed.

Salmon snagging was identified as an issue, and more patrols by DFG on the Feather River and along the banks near popular fishing spots may discourage anglers from using this illegal method of fishing. However, DFG currently lacks adequate staff to consistently monitor fishing activity. Another measure to counteract snagging would be to make anglers more aware that snagging is illegal and punishable by law by posting large signs, especially at the Afterbay outlet, that detail the regulations and consequences of violating these regulations.

Respondents also identified the inadequacy of toilet and trash facilities along this segment for the type and amount of use this segment receives, especially during prime fishing times. Any such new facilities should be located and constructed in a way that would not detract from the setting of the river. In addition, respondents mentioned the lack of emergency facilities along Segment 2; to address this concern, emergency-use telephones could be installed at any new facility or boat ramp.

In terms of camping facilities, there does not appear to be a lack of available tent camping right now. Most river users are not overnight users, and there are already two dispersed camping areas adjoining the river on either side of the Afterbay outlet that do not appear to be reaching or exceeding capacity. Although suggested, there appears no real need for a host or hostess, as this camping area is undeveloped and only dispersed camping is allowed.

Finally, part of this segment receives mostly non-motorized boat use because of the shallowness of the river and the low flow. However, some respondents mentioned that powered boats were ruining their recreational experience and there should be “non-motorized days,” or days where motorized boats are not allowed on certain parts of the river. Additional review would be necessary to evaluate motorized and non-motorized use on this segment, the effects of motorized boats on wildlife and wildlife viewing in this section, as well as the conflicts between motorized and non-motorized boaters to determine if non-motorized days are needed.

6.2.3 Segment 3

Respondents identified access, flow, and general boating issues in Section 3. The primary access issues were reported to be the inadequate number of existing launch ramps and the difficulty using them. Respondents suggested paving existing ramps; specifically, improvement to the ramps located near the OWA Vance and Palm Avenue entrances. Currently these are informal ramps; however, both are potential locations for development of formal ramps with a good launching surface and parking capacity. Development of these ramps would offer a significant increase in the number of ramps available to non-4WD vehicles throughout the year, but any potential development would need to be evaluated in the context of inevitable periodic flooding of these areas.

One respondent mentioned that there is no public ramp below Palm Avenue; however, the area downstream of the OWA boundary is not within the study area. The respondent suggested that an agreement could be worked out with the City of Gridley to make the city ramp a public daily-fee facility. Although it would be out of the study area, stakeholders could work with the City of Gridley to offer a public ramp to help maintain continuity along the river by offering geographically-spaced public launch facilities, allowing boaters to continue downstream without having to backtrack several miles upriver to take-out at a public boat ramp.

Although focus group members mentioned that there is no take-out at the end of the OWA, the informal Palm Avenue ramp is near the downstream end of the OWA and could be used as a take-out. Focus group members may not know where this ramp is located because it is informal and unmaintained. Distribution of revised maps may help boaters realize where take-outs are located in relation to other landscape features.

Although flow in Segment 3 is significantly higher than in Segment 2, respondents still identified low flows as an issue for Segment 3, particularly during the salmon season. More water could be let out of the Afterbay, but effects on the Afterbay from fluctuating and decreased water levels, probably cooler water temperatures, and downstream effects from increased flows, would need to be evaluated.

General boating issues identified for Segment 3 focus on fishing regulations, unsafe boaters, bank anglers, and vehicle vandalism. Respondents suggested that more

presence and patrols by DFG would help resolve issues regarding fishing regulations and bank anglers. Restricting leader length for “bead” anglers was also mentioned to help address the perceived issue of excess fishing line in the water. Increased patrols of parking areas may help deter vehicle vandalism. However, DFG does not currently have the staffing or the funding available to frequently patrol parking areas or monitor and enforce fishing regulations. Lastly, to address the issue of unsafe boaters, respondents suggested there be a Department of Motor Vehicles training test and that either an enforceable speed limit should be set for the river or motor size should be limited to 50 horsepower. However, enforcing a speed limit or horsepower limitation would require more management and enforcement presence either by DFG or possibly the Butte County Sheriff, and may have other implications for safety during periods with higher flow.

6.2.4 Other Lower Reach Conclusions

Surveys of the lower reach and of the focus group asked what could be done to improve the boating experience on these Feather River segments and what would increase boater-use on these segments. Responses were general to all river segments and cannot be associated with any one segment. Most responses focused on cleaning up the trash on the river, providing more trash receptacles, increasing DFG presence (especially to enforce regulations on snagging), providing more information about launch ramp locations (including maps), improving launch facilities, providing security patrols for vehicle safety, limiting motorized and jet boating, and increasing flows.

Additional comments include changing surface fishing regulations in the low flow area, providing toilet and trash facilities at boat ramps (especially at the Thermalito Afterbay outlet), and maintaining and improving the quality of the fishery and other wildlife.

Currently, the lower reach has relatively little in the way of developed facilities and management presence. Improvement of facilities and better information on the location of river facilities could improve the visitor experience on the lower reach. However, developing facilities may increase use, which would result in further increased need for management and maintenance, as well as impact the setting and kinds of experiences visitors can expect on this part of the Feather River.

6.3 MIDDLE FORK FEATHER RIVER (MFFR)

Much of the Bald Rock Canyon run on the Middle Fork is not within the Project 2100 boundary, though the take-out is within the project boundary area. This run is extremely difficult and probably not used by many boaters; therefore, providing public road access to this area may not be cost-effective. If the run becomes more popular in the future, access facilitation or provision may need to be re-evaluated.

6.4 STAKEHOLDER-PROPOSED WHITEWATER PARK

Development of a whitewater park could potentially set the Oroville area apart in a new way, making it unique among almost all water-based recreation areas in the region and creating year-round whitewater recreation opportunities. However, the possibility of a whitewater park in the Oroville area would need to be studied further before being considered. There are potential power generation, fishing issues, and potentially high development costs to discuss. Although whitewater parks can help further waterfront development, the potential park sites would need to be evaluated as to whether waterfront development is feasible, and to what extent waterfront development would benefit the community. More specific use estimates would need to be done on how much use the park would receive and who would make up the potential user group. With the opening of the new whitewater park in Reno, potential demand would need to be examined further. Questions regarding funding park construction and management, park fees, and when the park would be open would also need to be resolved.

This page intentionally left blank.

7.0 REFERENCES

7.1 DOCUMENTS AND LITERATURE CITED

- Armstead, Lloyd. 2003. Definition of whitewater. Site accessed August 15, 2003.
URL= <http://www.e-raft.com/reference.asp>
- Cassady, Jim and Calhoun, Fryar. 1990. California Whitewater. North Fork Press, Berkeley, California. 299pp.
- DWR (Department of Water Resources) and DPR (Department of Parks and Recreation). 1993. Agreement Concerning the Operation of the Oroville Division of the State Water Project for Management of Fish & Wildlife.
- DWR. 2002. Northern District Metadata. Provided to EDAW on January 24, 2002.
- DWR. 2003a. California Data Exchange Center (CDEC). Total Release – Feather River below Thermalito (THA station). Sensor ID number 8996. Site accessed August 2003. URL = <http://cdec.water.ca.gov/cgi-progs/queryDaily?THA>
- DWR. 2003b. Oroville Facilities Relicensing Recreation Studies, Interim Report Critical Path Field Studies (R-13, R-9, R-7). pp.110.
- EDAW, Inc. 2001. Whitewater Boating Assessment Report. Poe Hydroelectric Project, FERC No. 2107. Prepared for Pacific Gas and Electric Company, San Francisco, California.
- Holbek, Lars and Stanley, Chuck. 1998. The Best Whitewater in California. Watershed Books, Coloma, California. 345 pp.
- NOAA (National Oceanic and Atmospheric Administration) Fisheries. 2000. Biological Opinion on Central Valley Project Improvement Act.
- Northeastern Whitewater USA Website. Site accessed on August 28, 2003. URL = <http://home.epix.net/~ab257/>.
- Reimers, Frederick. 2002. "Park and Play: An inside look at the nation's top urban whitewater parks." Paddler, vol. 22, issue no.3.
- USGS (U.S. Geological Survey). 2003. Information from gauges 11404500, 11404900 and 11404901. Site accessed March 20, 2003. URL = <http://waterdata.usgs.gov/nwis>.
- WFG (Whitewater Focus Group). 2003. Focus group meeting held May 7, 2003 in Chico, California to address whitewater and river boating on the Feather River. Meeting held by EDAW, Inc., San Francisco, CA.

Whittaker, D., B. Shelby, W. Jackson, and R. Beschta. 1993. Instream Flows for Recreation: A Handbook on Concepts and Research Methods. National Park Service. Anchorage, AK.

7.2 PERSONAL COMMUNICATIONS

Creel, C., Chief, Operations Planning Branch, California Department of Water Resources; e-mail communication with A. Lienemann, Environmental Planner, EDAW, San Francisco, California; February 2003.

Huber, S., Owner, Steve Huber's Drift Boat Guide Service, personal communication with A. Lienemann, Environmental Planner, EDAW, San Francisco, California; May 2003.

Kastner, A., Hatchery Manager, Feather River Fish Hatchery, California Department of Fish and Game; personal communication with I. Ferguson, Environmental Analyst, EDAW, San Francisco, California; July 2003.

See, E., Staff Environmental Scientist, California Department of Water Resources, personal communication with A. Lienemann, Environmental Planner, EDAW, San Francisco, California; August 2003.

Sherman, J., Supervising Ranger, Lake Oroville State Recreation Area, California Department of Parks and Recreation, Oroville, California; personal communication with A. Lienemann, Environmental Planner, EDAW, San Francisco, California; July 2003.

APPENDIX A

FOCUS GROUP SURVEY AND DISCUSSION

This page intentionally left blank.

INSERT SURVEY

**2003
Lake Oroville Area
Recreation Survey**

**Whitewater and River Boating
Survey**

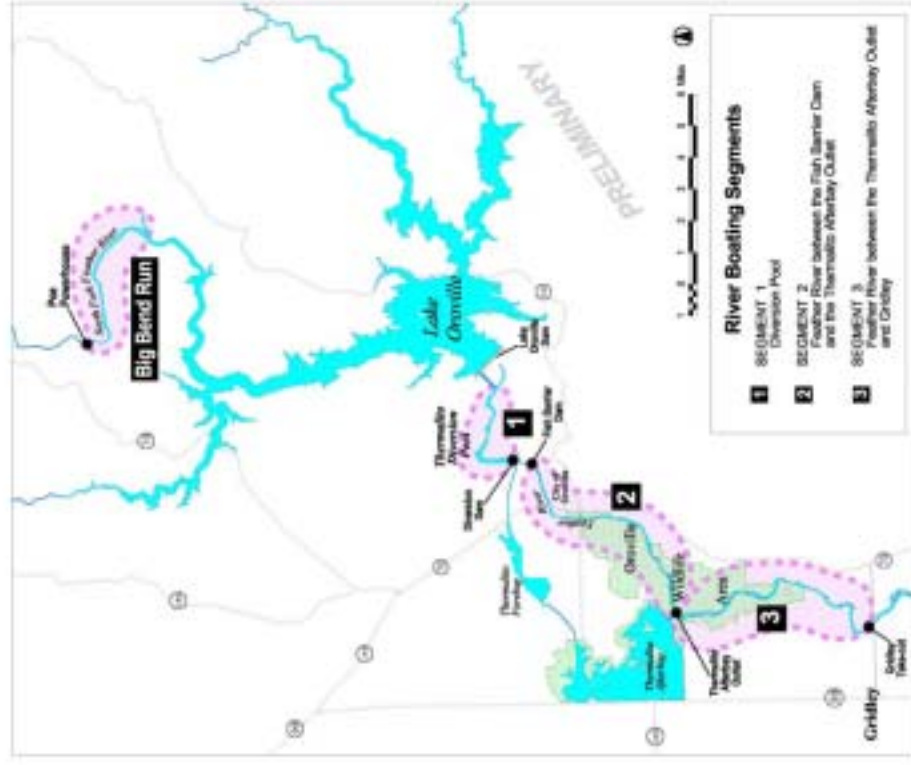


California Department of Water Resources

For office use.

Date _____

Location _____



Whitewater & River Boating Survey Map

00000

Thank you for your participation in this important recreation study!

Q-35. Other than boating, what other activities do you participate in on these lower three Feather River segments? *(Mark all that apply)*

Fishing	Picnicking	Wildlife viewing
Swimming	Sunbathing	Photography
Hunting	Other: _____	

Q-36. How long per trip do you typically boat on any of these 3 segments?
_____ hours

IMPROVEMENTS

What could be done to make boating on the Feather River between the Oroville Dam and Gridley a better experience for you? What would make you use this stretch of the Feather River more?

FINALLY A FEW QUESTIONS ABOUT YOURSELF:

Q-37. What is your age? _____ years

Q-38. Are you: male _____ female _____

Q-39. Where do you reside? City _____ State _____

THANK YOU for participating in this important survey.

If you have any additional comments about the existing or future management of land and recreation resources in the area, please use the space below or use additional pieces of paper.

Whitewater and River Boating Survey

Please complete the following survey as completely as possible. Your views about whitewater and river boating in the Project Area are extremely important to us. Please **mark the box corresponding with your answer or fill in your answer**, unless otherwise instructed.

PART 1. User Characteristics

- Q-1.** In terms of whitewater boating, how would you rate your own skill level?
- | | | | |
|--------------------------|--------------------------------|--------------------------|--------|
| Beginner
(Class I-II) | Intermediate
(Class III-IV) | Advanced
(Class IV-V) | Expert |
|--------------------------|--------------------------------|--------------------------|--------|
- Q-2.** In general, how many days per year do you spend whitewater boating? _____ days per year
- Q-3.** What type of craft do you usually use for whitewater boating? *(Mark one)*
- | | |
|---------------------------|-------------------------------|
| Hard shell kayak | Catacraft |
| Inflatable kayak | Self-bailing raft |
| Closed deck canoe | Wrap-floor raft |
| Open canoe with flotation | Other: (please explain) _____ |

PART 2. Trip Characteristics

- Q-4.** How many years have you been boating on the Big Bend run (North Fork of the Feather River between the Poe Powerhouse and Lake Oroville)?
_____ years _____ year you started boating on Big Bend run
- Q-5.** How often do you boat on the Big Bend run (in a typical runnable year)? _____ days per year
- Q-6.** How long per trip do you typically boat on this section?
- | | |
|-------|-----------------------|
| Runs | how many? _____ runs |
| Hours | how many? _____ hours |
- Q-7.** What type of craft do you most often use for whitewater paddling on this section of the North Fork of the Feather River? *(Mark one)*
- | | |
|---------------------------|---|
| Hard shell kayak | Catacraft (please indicate length: _____) |
| Inflatable kayak | Self-bailing raft (please indicate length: _____) |
| Closed deck canoe | Wrap-floor raft (please indicate length: _____) |
| Open canoe with flotation | Other: (please explain) _____ |

Q-8. What time of year do you usually boat on the Big Bend run? (*Mark all that apply*)

Season	Time Period
Spring	March, April and May
Summer	June, July and August
Fall	September, October and November
Winter	December, January and February

Q-9. How would you characterize the quality of the whitewater experience on this section? (*Mark one*)

Tiresome	Fun	Risky, high water
Boring	Challenging	Extreme hazard
Good training/warm up	Risky, low water	Other: _____

GROUP

Q-10. Typically when you are boating this run, how many people are with you? (*Mark one*)

1 (only me)	4-5 people	11-15 people
2-3 people	6-10 people	More than 15 people

Q-11. Who are the people in your typical group? (*Mark one*)

Family only	Family and friends	Friends only
I am usually alone	Other paddling group members	Organized group (church, club, etc)

LAKE LEVEL

Q-12. How do you know when the run is available (exposed)? _____

Q-13. At what lake level(s) do you usually boat this run? _____ feet don't know

Q-14. What is the **maximum lake level** you will boat this run? _____ feet don't know
How long is the paddle out at this level? _____ hours don't know

Q-15. What lake level provides the highest quality whitewater experience? _____ feet don't know

Q-29. Where do you usually put-in?

Segment 1	_____
Segment 2	_____
Segment 3	_____

Q-30. Where do you usually take-out?

Segment 1	_____
Segment 2	_____
Segment 3	_____

Q-31. What time of year do you usually boat on these segments of the Feather River? (*Mark all that apply*)

Season	Time Period	River Segment		
		1	2	3
Spring	March, April and May			
Summer	June, July and August			
Fall	September, October and November			
Winter	December, January and February			

Q-32. How many people are with you on a typical visit to these segments? (*Mark one*)

1 (only me)	4-5 people	11-15 people
2-3 people	6-10 people	More than 15 people

Q-33. Who are the people in your typical group? (*Mark one*)

Family only	Family and friends	Friends only
I am usually alone	Other paddling group members	Organized group (church, club, etc)

Q-34. What kind of boat do you most often use on these segments? (*Mark one*)

Drift Boat	Kayak	Jet Boat
Canoe	Inflatable Raft	Other _____

WHITEWATER PARK

We would like to know if you have thoughts about the possible development of a “whitewater park” in Oroville, hypothetically on the Feather River somewhere below Oroville Dam.

Q-25. What level of regular use do you think such a “whitewater park” would receive? (Mark one)

High

Medium

Low

Why? _____

Q-26. How often would you use such a “whitewater park”? (Mark one)

Once a week or more

Once a month

Less than once every 2 months

Once every two weeks

Once every 2 months

Depends on entry fee

Q-27. What activities or events would you like to see available at such a “whitewater park”?

Any other comments on a possible Feather River “whitewater park”? _____

LOWER FEATHER RIVER REACHES

Please refer to the map at the front for location of each lower Feather River segment. Skip to Q-37 if you do not use the lower Feather River segments.

Q-28. Do you boat below the Oroville Dam on the following Feather River segments (mark all that apply):

Segment 1. Diversion Pool how many days per year? _____ days/year

Segment 2. Low Flow Section how many days per year? _____ days/year

Segment 3. Afterbay Outlet to Gridley how many days per year _____ days/year

FLOW

Q-16. At what flow do you usually boat this run? _____ cfs don't know

Q-17. What is the **minimum flow** you will boat this run? _____ cfs don't know
the **maximum flow**? _____ cfs don't know

Q-18. What flow provides the highest quality whitewater experience? _____ cfs don't know

ACCESS

Q-19. For this part of the Feather River (North Fork between the Poe Powerhouse and Lake Oroville), have you ever encountered access constraints?

Yes

No

Unsure

If Yes:

Where? _____

What is the issue? _____

What is your suggested solution? _____

Q-20. Where do you typically put-in for this section? (nearby road or landmark)

Where do you typically take-out for this section? (nearby road or landmark)

Are there other points where you would like to take-out for this section?

OTHER SITES

Q-21. Do you ever boat on any of the following other local reaches of the Feather River?

Poe Project (Poe Dam to Powerhouse) _____ # of days per average year you boat there
 When do you boat here? Spring Summer Fall Winter

Rock Creek reach of the FR _____ # of days per average year you boat there
 When do you boat here? Spring Summer Fall Winter

Cresta reach of the FR _____ # of days per average year you boat there
 When do you boat here? Spring Summer Fall Winter

Other North Fork FR runs _____ # of days per average year you boat there
 When do you boat here? Spring Summer Fall Winter

Middle Fork reach of the FR _____ # of days per average year you boat there
 When do you boat here? Spring Summer Fall Winter

Don't boat on any of these reaches – Skip to Q-22.

Q-22. If you boat on these other local runs, how does the Big Bend run on the North Fork of the Feather River compare?

Compared to...	The Big Bend run is...					
	Much Worse	Worse	About the Same	Better	Much Better	Not Comparable
Poe Project	1	2	3	4	5	N/A
Rock Creek	1	2	3	4	5	N/A
Cresta	1	2	3	4	5	N/A
Other North Fork runs	1	2	3	4	5	N/A
Middle Fork	1	2	3	4	5	N/A

Q-23. On a regular basis, where else do you whitewater boat in Northern California?
 Don't boat anywhere else in Northern California (skip to Q-24)

Location: _____
 # of days per average year you boat there _____
 When do you boat here? Spring Summer Fall Winter

Location: _____
 # of days per average year you boat there _____
 When do you boat here? Spring Summer Fall Winter

Location: _____
 # of days per average year you boat there _____
 When do you boat here? Spring Summer Fall Winter

Q-24. Compared to other rivers, how would you rate boating opportunities on the Big Bend run on the North Fork of the Feather River? (Circle one number for each; if you are unsure about a comparison, leave that item blank).

Compared to...	The Big Bend run is. . .				
	Worse than average	Average	Better than average	Excellent	Among the very best
...other rivers in Northern California	1	2	3	4	5
...other rivers in California	1	2	3	4	5
...other rivers in the Western U.S.	1	2	3	4	5

IMPROVEMENTS

What could be done to make whitewater boating on the North Fork of the Feather River a better experience for you? What would make you use this stretch of the Feather River more?

Focus Group Questions

1. Upper Run

- € Describe the run.
- € Are there any portages on the run?
- € Any problems with hits/stops/draggs that they can remember?
- € Big Bend Dam – What is it like? How high is it? How tough is it? Is it easy to portage around it or do you have to shoot it? Does the dam make the run harder (higher classification)?
- € At what point does this reach really become a run? When is there enough of the run exposed that people will go there? When is the run a worthwhile adventure? Any idea what lake level that is? How do you know when it's useable? When is the reach usually runnable? Is there flow info available?
- € Can they map out the run – then we can figure out when the lake gets below that point, Where is the last rapid? When do they normally do the run? Months
- € How many years has the Big Bend run been available in the last decade? How long is the paddle out now? How much flatwater is there? Min, Max? How long does it usually take? Min, Max?
- € Where do they think a good take-out place would be, road to it. map it out. In what area would they want a new road if that were feasible? Which side of the river? Are there any access roads that they think could be extended?
- € How do they think the shuttle would work? When would it be in service? Where would it pick you up and drop you off?
- € Any problems now with parking at Dark Canyon? Poe Powerhouse? What don't you like about the run? Any other issues with this run?
- € What are other comparable runs to this one – on the Feather, in Northern California? Within 250 mile radius
- € What do they think is the potential size of the user group for this run? What would happen if improvements were made (ex. shuttle, access road)? How much would use go up? How many user days do you think the run has now?
- € Would commercial rafting operations be a detriment to the run or user experience of kayakers?
- € Is there a willingness to pay a small user fee to support the development and maintenance of facilities (i.e., parking, garbage collection, bathrooms)? If so, how large should the fee be?

2. Lower Runs

- € Do they ever use these 2 stretches?
- € When do they use them? Why – for what reasons?
- € Where do they put-in and take-out?
- € Any spots they would like to use but can't? Why not?
- € Would anything make them use these stretches more? Any improvements they would like (bathrooms, access, facilities, other put-in/take-out areas)?

- € Any problems with other users?
- € Willing to pay a small user fee to support facilities described above?

3. Whitewater Park

- € Where could it go? Exact location if other sites offered.
- € What could it be like?
- € What could be included? Not included?
- € What support facilities (i.e., outdoor supplies, food concessions, green belt, bikepath, horseback riding trails, camping, bathrooms) could be included?
- € Who do they think would use it? How many people would come to Oroville just to use the park? Would a whitewater park attract non whitewater boaters to the Lake Oroville Recreation Area?
- € How much use would it get? Would crowding be an issue?
- € What other activities could go on there?
- € For what level of whitewater experience could the park be for?
- € When would the park be open?
- € What about conflicts with other river users? How would that be handled? How could multiple recreation activities be accommodated?
- € Pricing – How would you pay to use it? Who would you pay? Who would manage it?
- € What other outdoor recreation activities do you normally participate in?
- € Could the channel include a combination of play features and capability to arrange a slalom course?

APPENDIX B

DEFINITION OF THE SIX WHITEWATER DIFFICULTY CLASSES

This page intentionally left blank.

Class I: Easy. Fast moving water with ripples and small waves. Few obstructions, all obvious and easily missed with little training. Risk to swimmers is slight; self-rescue is easy.

Class II: Novice. Straightforward rapids with wide, clear channels which are evident without scouting. Occasional maneuvering may be required, but rocks and medium sized waves are easily missed by trained paddlers. Swimmers are seldom injured and group assistance, while helpful, is seldom needed. Rapids that are at the upper end of this difficulty range are designated "Class II+."

Class III: Intermediate. Rapids with moderate, irregular waves which may be difficult to avoid and which can swamp an open canoe. Complex maneuvers in fast current and good boat control in tight passages or around ledges are often required; large waves or strainers may be present but are easily avoided. Strong eddies and powerful current effects can be found, particularly on large-volume rivers. Scouting is advisable for inexperienced parties. Injuries while swimming are rare; self-rescue is usually easy but group assistance may be required to avoid long swims. Rapids that are at the lower or upper end of this difficulty range are designated "Class III-" or "Class III+" respectively.

Class IV: Advanced. Intense, powerful but predictable rapids requiring precise boat handling in turbulent water. Depending on the character of the river, it may feature large, unavoidable waves and holes or constricted passages demanding fast maneuvers under pressure. A fast, reliable eddy turn may be needed to initiate maneuvers, scout rapids, or rest. Rapids may require "must" moves above dangerous hazards. Scouting may be necessary the first time down. Risk of injury to swimmers is moderate to high, and water conditions may make self-rescue difficult. Group assistance for rescue is often essential but requires practiced skills. A strong Eskimo roll is highly recommended. Rapids that are at the lower or upper end of this difficulty range are designated "Class IV-" or "Class IV+" respectively.

Class V: Expert. Extremely long, obstructed, or very violent rapids which expose a paddler to added risk. Drops may contain large unavoidable waves and holes or steep, congested chutes with complex, demanding routes. Rapids may continue for long distances between pools, demanding a high level of fitness. What eddies exist may be small, turbulent, or difficult to reach. At the high end of the scale, several of these factors may be combined. Scouting is recommended but may be difficult. Swims are dangerous, and rescue is often difficult even for experts. A very reliable Eskimo roll, proper equipment, extensive experience, and practiced rescue skills are essential. Because of the large range of difficulty that exists beyond Class IV, Class V is an open ended, multiple level scale designated as Class 5.0, 5.1, 5.2 etc. Each of these levels is an order of magnitude more difficult than the last. Example: Increasing difficulty from Class 5.0 to Class 5.1 is a similar order of magnitude as increasing from Class IV to Class V.

Class VI: Extreme and Exploratory. These runs have almost never been attempted and often exemplify the extremes of difficulty, unpredictability and danger. The consequences of errors are severe and rescue may be impossible. For teams of experts only, at favorable water levels, after close personal inspection and taking all precautions. After a Class VI rapids has been run many times, its rating may be changed to an appropriate Class 5.X rating.

APPENDIX C

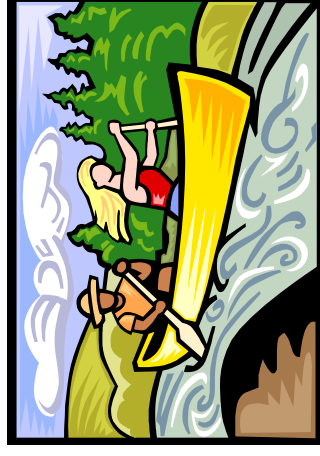
LOWER REACH SURVEY

This page intentionally left blank.

Insert Lower Reach Survey

**2003
Lake Oroville Area
Recreation Survey**

River Boating Survey

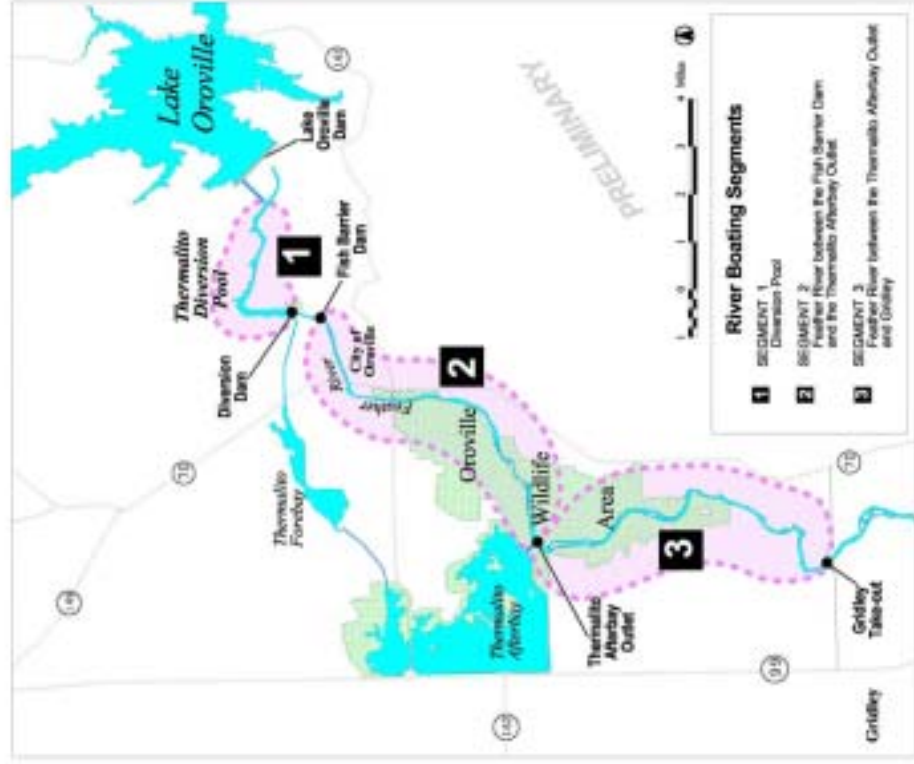


California Department of Water Resources

For office use.

Date _____

Location _____



Thank you for your participation in this
important recreation study!

THANK YOU for participating in this important survey.

If you have any additional comments about the existing or future management of river boating opportunities in the area, please use the space below or use additional pieces of paper.

River Boating Survey

Please complete the following survey as completely as possible. Your views about boating on the Feather River are extremely important to us. Please **mark the box corresponding with your answer** or **fill in your answer**, unless otherwise instructed.

TRIP CHARACTERISTICS

Please refer to the map for locations of Feather River segments.

Q-1. In general, how many days per year do you spend river boating? _____ days per year

_____ No _____ Yes _____ days per year

→ Go to Q-4

Q-3. What kind of boat do you most often use on this segment? (*Mark one*)

Drift Boat

Kayak

Jet Boat

Canoe

Inflatable Raft

Other _____

Q-4. Do you boat on **Segment 2** of the Feather River (from the Fish Barrier Dam down to the Thermalito Afterbay Outlet, also called the Low Flow Section)?

_____ No _____ Yes _____ days per year

→ Go to Q-6

Q-5. What kind of boat do you most often use on this segment? (*Mark one*)

Drift Boat

Kayak

Jet Boat

Canoe

Inflatable Raft

Other _____

Q-6. Do you boat on **Segment 3** of the Feather River (between Thermalito Afterbay Outlet and Gridley)

_____ No _____ Yes _____ days per year

→ Go to Q-8

Q-7. What kind of boat do you most often use on this segment? (*Mark one*)

Drift Boat

Kayak

Jet Boat

Canoe

Inflatable Raft

Other _____

Q-8. How many years have you been boating on any of these three Feather River segments? _____ years _____ year you started boating?

Q-9. What time of year do you usually boat on these segments of the Feather River?
(*Mark all that apply*)

Season	Time Period	River Segment		
		1	2	3
Spring	March, April and May			
Summer	June, July and August			
Fall	September, October and November			
Winter	December, January and February			

ACTIVITIES

Q-10. Which of the following boating activities have you **ever** participated in while on any of these three segments?

Kayaking	Rafting with paddles	Canoeing
Inflatable kayak	Rafting in an oar boat	
Q-11. Other than boating, what other activities do you participate in while boating on these three Feather River segments? (<i>Mark all that apply</i>)		
Fishing	Picnicking	Wildlife viewing
Swimming	Sunbathing	Photography
Hunting	Other: _____	

Q-12. Have you ever taken a guided trip (where you were the client) on Segment 1, 2, or 3 of the Feather River?

_____ No _____ Yes Segment 1 _____ 2 _____ 3 _____

Q-13. Have you ever led a guided trip (where you had customers) on Segment 1, 2 or 3 of the Feather River?

_____ No _____ Yes Segment 1 _____ 2 _____ 3 _____
Are you currently a guide? _____ Yes _____ No

-2-

PUT-IN and TAKE-OUT

Q-20. Where do you usually put-in?

Segment 1 _____
Segment 2 _____
Segment 3 _____

Q-21. Where do you usually take-out?

Segment 1 _____
Segment 2 _____
Segment 3 _____

IMPROVEMENTS

Q-22. What could be done to make your boating experience on these Feather River segments better for you? What would make you use these segments more?

FINALLY A FEW QUESTIONS ABOUT YOURSELF:

Q-23. What is your age? _____ years

Q-24. Are you: male _____ female _____

-7-

Q-19. For Segment 3, the Feather River between the Thermalito Afterbay Outlet and Gridley, have you ever encountered:

Access issues or problems?

Yes No Unsure

If yes:
Where? _____
What is the issue/problem? _____
What is your suggested solution? _____

Any problems with flow rates?

Yes No Unsure

If yes:
Were flow rates too high too low
What is the resulting problem? _____
What is your suggested solution? _____

Any general boating issues or problems?

Yes No Unsure

If yes:
Where? _____
What is the issue/problem? _____
What is your suggested solution? _____

GROUP

Q-14. How many people are with you on a typical visit to any of these segments? (*Mark one*)

1 (only me) 4-5 people 11-15 people
2-3 people 6-10 people More than 15 people

Q-15. Who are the people in your typical group? (*Mark one*)

Family Only Family and friends Friends Only
I am usually alone Clients (guiding trip) Organized group (club, church, school, etc.)

HISTORY OF USE

Q-16. Compared to other years, would you say that within the last 12 months you used . . . (*Mark all that apply*)

Segment 1: Diversion Pool

Less why? _____
Same as other years _____
More why? _____
Have not used _____

Segment 2: Feather River from the Fish Barrier Dam to the Thermalito Afterbay Outlet

Less why? _____
Same as other years _____
More why? _____
Have not used _____

Segment 3: Feather River between the Thermalito Afterbay Outlet and Gridley

Less why? _____
Same as other years _____
More why? _____
Have not used _____

ISSUES

Q-17. For Segment 1, the Diversion Pool, have you ever encountered:

Access issues or problems?

Yes No Unsure

If yes:
Where? _____

What is the issue/problem? _____

What is your suggested solution? _____

Any problems with flow rates?

Yes No Unsure

If yes:
Were flow rates too high too low

What is the resulting problem? _____

What is your suggested solution? _____

Any general boating issues or problems?

Yes No Unsure

If yes:
Where? _____

What is the issue/problem? _____

What is your suggested solution? _____

Q-18. For Segment 2, the Feather River from the Fish Barrier Dam to the Thermalito Afterbay Outlet, have you ever encountered:

Access issues or problems?

Yes No Unsure

If yes:
Where? _____

What is the issue/problem? _____

What is your suggested solution? _____

Any problems with flow rates?

Yes No Unsure

If yes:
Were flow rates too high too low

What is the resulting problem? _____

What is your suggested solution? _____

Any general boating issues or problems?

Yes No Unsure

If yes:
Where? _____

What is the issue/problem? _____

What is your suggested solution? _____

APPENDIX D

LAKE OROVILLE ELEVATIONS SINCE 1968

This page intentionally left blank.

Table D-1. Days per month Lake Oroville at an elevation of 620 feet or less.

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec	Total Days in Year
1968	31	20											51
1969													0
1970													0
1971													0
1972													0
1973													0
1974													0
1975													0
1976													0
1977													0
1978													0
1979													0
1980													0
1981													0
1982													0
1983													0
1984													0
1985													0
1986													0
1987													0
1988													0
1989													0
1990													0
1991													0
1992													0
1993													0
1994													0
1995													0
1996													0
1997													0
1998													0
1999													0
2000													0
2001													0
2002													0

Source: Pers. comm. Creel 2003.

Table D-2. Days per month Lake Oroville at an elevation of 650 feet or less.

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec	Total Days in Year
1968	31	23											54
1969													0
1970													0
1971													0
1972													0
1973													0
1974													0
1975													0
1976													0
1977								16	30	31	29	4	110
1978													0
1979													0
1980													0
1981													0
1982													0
1983													0
1984													0
1985													0
1986													0
1987													0
1988													0
1989													0
1990													0
1991													0
1992													0
1993													0
1994													0
1995													0
1996													0
1997													0
1998													0
1999													0
2000													0
2001													0
2002													0

Source: Pers. comm. Creel 2003.

Table D-3. Days per month Lake Oroville at an elevation of 720 feet or less.

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec	Total Days in Year
1968	31	29	25										85
1969													0
1970													0
1971													0
1972													0
1973													0
1974													0
1975													0
1976													0
1977				1	31	30	31	31	30	31	30	31	246
1978	11												11
1979													0
1980													0
1981													0
1982													0
1983													0
1984													0
1985													0
1986													0
1987													0
1988													0
1989													0
1990								29	30	31	30	31	151
1991	31	28	31	7				19	29	31	30	31	237
1992	31	19						6	30	31	30	31	178
1993													0
1994													0
1995													0
1996													0
1997													0
1998													0
1999													0
2000													0
2001											28		28
2002									8	31	30	26	95

Source: Pers. comm. Creel 2003.

Table D-4. Days per month Lake Oroville at an elevation of 730 feet or less.

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec	Total Days in Year
1968	31	29	31	1									92
1969													
1970													
1971													
1972													
1973													
1974													
1975													
1976													
1977				10	31	30	31	31	30	31	30	31	255
1978	13												13
1979													
1980													
1981													
1982													
1983													
1984													
1985													
1986													
1987													
1988										5	17		22
1989													
1990							7	31	30	31	30	31	160
1991	31	28	31	18			16	31	30	31	30	31	277
1992	31	26						21	30	31	30	31	200
1993	12												12
1994													
1995													
1996													
1997													
1998													
1999													
2000													
2001									20	31	30	21	102
2002									26	31	30	27	114

Source: Pers. comm. Creel 2003.

Table D-5. Days per month Lake Oroville at an elevation of 750 feet or less.

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec	Total Days in Year
1968	31	29	31	19		7	31	31	30	7			216
1969													0
1970													0
1971													0
1972													0
1973													0
1974												5	5
1975	31	6											37
1976											1	31	32
1977	31	28	31	30	31	30	31	31	30	31	30	31	365
1978	16												16
1979													0
1980													0
1981													0
1982													0
1983													0
1984													0
1985													0
1986													0
1987													0
1988								8	30	31	30	31	130
1989	13	11											24
1990							30	31	30	31	30	31	183
1991	31	28	31	30	30	27	31	31	30	31	30	31	361
1992	31	29	16				17	31	30	31	30	31	246
1993	19												19
1994									2	29	30	31	92
1995	7												7
1996													0
1997													0
1998													0
1999													0
2000													0
2001	1							25	30	31	30	31	148
2002	3							15	30	31	30	31	140

Source: Pers. comm. Creel 2003.

Table D-6. Days per month Lake Oroville at an elevation of 800 feet or less.

Year	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec	Total Days in Year
1968	31	29	31	30	31	30	31	31	30	31	30	31	366
1969	12												12
1970													0
1971													0
1972													0
1973													0
1974										17	30	31	78
1975	31	28	10										69
1976							10	31	30	31	30	31	163
1977	31	28	31	30	31	30	31	31	30	31	30	31	365
1978	31	7											38
1979													0
1980													0
1981													0
1982													0
1983													0
1984													0
1985								3	30	31	30	31	125
1986	15												15
1987								20	30	31	30	9	120
1988							29	31	30	31	30	31	182
1989	31	28	10						11	31	30	31	172
1990	31	28	31	30	31	30	31	31	30	31	30	31	365
1991	31	28	31	30	31	30	31	31	30	31	30	31	365
1992	31	29	31	30	31	30	31	31	30	31	30	31	366
1993	31	13											44
1994							20	31	30	31	30	31	173
1995	12												12
1996													0
1997								5	29	31	30	24	119
1998													0
1999												2	2
2000	22							15	30	31	30	31	159
2001	31	28	31	30	30	30	31	31	30	31	30	31	364
2002	31	28	8				22	31	30	31	30	31	242

Source: Pers. comm. Creel 2003.